Provincial Geologists Journal

Journal des géologues provinciaux

1997 - VOLUME 15

Published annually by the Committee of Provincial Geologists
Publication annuelle du Comité des géologues provinciaux

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Compiled by the
British Columbia Geological Survey Branch

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Committee of Provincial Geologists 1997 *inside back cover*

COMMITTEE OF PROVINCIAL GEOLOGISTS
CHAIRPERSON'S REPORT 1997

The Committee of Provincial Geologists (CPG) had two full-committee meetings during the year: the first in Toronto, in March, in conjunction with the PDAC Convention, and the second in St. John's, in July, in conjunction with the Mines and Energy Ministers Conference. After each meeting, the CPG met jointly with the Geological Survey of Canada (GSC) under the auspices of the National Geological Surveys Committee (NGSC). Further communications regarding regular business and special projects were effected throughout the year via e-mail and conference calls.

Two significant and successful activities supported by the Committee during the year were the "Team Canada" exhibit at the PDA and the "Geoscience Workshop" at the Mines and Energy Ministers Conference. The Team Canada exhibit saw all the provincial and territorial surveys combine with the GSC in a single-area display at the Metro Toronto Convention Centre, site of the March 1997 PDAC Exhibition. Flags and other trappings, along with the excellent individual displays, served to give Canada important profile during the increasingly international PDAC convention. The cooperation between the CPG and the GSC, as well as the support of the PDAC, will continue for an even better effort in 1998.

The Geoscience Workshop, sponsored by the NGSC and the PDAC, was entitled *Canada's Geoscience Knowledge Base: Maintaining Our Competitive Advantage*. Held in conjunction with the 54th Mines and Energy Ministers Conference in St. John's in July, the workshop was designed to draw attention to the importance of Canada's geoscience knowledge base and the plight of government surveys vis-à-vis funding. A summary report on the workshop follows elsewhere in the Journal, but it's worth noting here that its success was due in no small measure to the Workshop Planning Committee chaired by CPG's Ron Smyth of B.C. The Committee considered every aspect of the workshop dynamic, including breakout topics and the presentation of results to ministers. The effectiveness of the workshop reflects the careful planning and cooperation of the GSC and the PDAC with the CPG.

Another initiative related to the workshop and the Mines Ministers Conference was the production of posters demonstrating the positive impacts of government geoscience programs. Again this was a joint effort between the CPG and the GSC through the NGSC. The template for the posters was designed and coordinated by CPG's Scott Swinden of N.S., such that all sixteen posters were of similar size and format to make for easy perusal and assimilation of data. The posters covered each province and territory and provided a colourful and informative backdrop for both the Geoscience Workshop and the Mines Ministers meetings. Subsequently, through the coordinating efforts of the GSC, the posters were provided in digital format to the Canadian Geoscience Education Network for its public-awareness projects.

The Provincial Geologists Journal for 1996 (Volume 14) was published by the Committee through the coordinating and compilation efforts of the B.C. Survey. The Journal covered the geoscience activities of all jurisdictions and presented a summary of budget information pertinent to each survey. The B.C. Survey also continues to serve the CPG in that its Chief Geologist, Ron Smyth, is the new CPG Treasurer.

The interests of the CPG member surveys, as well as CPG service to the national geoscience community, were facilitated by CPG participation on several important committees and councils. Jan Boon of the Alberta Geological Survey represented CPG on the federal Ministers National Advisory Board on Earth Sciences (MNABES), meaningfully contributing to reviews of GSC's programs and policies. Andy Fyon of the Ontario Geological Survey represents CPG on the Canadian Geoscience Council. This year CPG agreed to continue supporting the Council by remaining as an Associate Member but volunteering to pay a membership fee of $200 per CGC member. Dr. Fyon also attended meetings of the Council of Chairs of Canadian Earth Science Departments (CCCESD) in 1997. The Council has provided a list of contacts at most Canadian universities for consultation by CPG during program planning. CPG and CCCESD have agreed to foster better communications in the future. Other committees supported by CPG include LITHOPROBE (Ron Smyth of B.C.) and NATMAP (Scott Swinden of N.S. and Carolyn Relf of N.W.T.). These allow CPG input into planning and decision making to maximize the benefits to its member surveys and Canadian geoscience. Other ad hoc national committees, such as the SHRIMP Advisory Committee

and the Task Force on Alternative Funding Arrangements for Government Geological Surveys, request and are given CPG support.

Throughout the year, CPG made representations on behalf of its members on a number of issues. One of the most important concerns the policies, e.g., royalties, of NRCan's Geomatics Canada regarding use of baseline geomatic data by provincial and territorial surveys. Satisfactory progress has been made in some jurisdictions by bilateral arrangements with Geomatics Canada. CPG also requested that the CGC lobby to have a geoscientist placed on the Prime Minister's Science Advisory Committee, resulting in a letter from CGC to Minister Manley requesting same.

The Intergovernmental Geoscience Accord (IGA) continues to set the cooperative tone for relationships between the GSC and CPG member surveys. Several surveys have signed (or are working on) bilateral agreements with the GSC, which further clarify the respective and collaborative roles of the GSC and the local surveys in their particular jurisdictions. The "needs studies" called for in the bilateral agreements are producing contemporary, stakeholder-influenced five-to-ten-year strategic plans for several jurisdictions in Canada. The IGA also stipulates that national workshops be held annually to review the GSC's national program and assist the GSC with planning. As 1997 is the first full year since the Accord's signing in September 1996, a first workshop has yet to be held. However, several planning sessions between the CPG and GSC, under the auspices of the NGSC, have taken place, and the first workshop is now scheduled for January, 1998.

Perhaps one of the most important indications of the increasingly cooperative nature of the relationship between the GSC and CPG member surveys is the sharing-geoscience resolution passed by NGSC at its July meeting in St. John's. It is reproduced below to remind us that we exist to serve the same public:

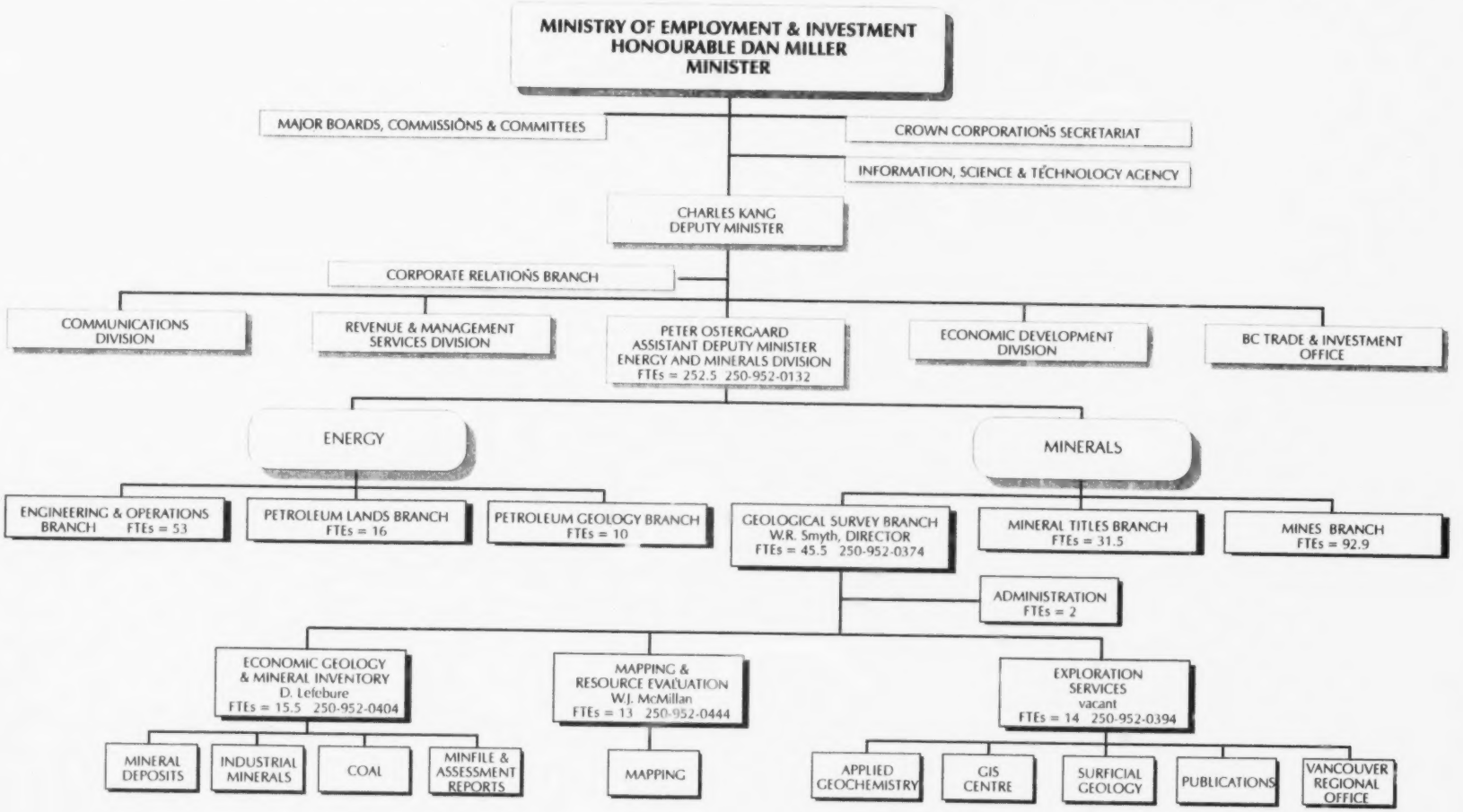
Whereas the Geological Survey of Canada and the provincial and territorial geological surveys are mandated to provide geoscientific knowledge on their various and overlapping jurisdictional areas in Canada; and whereas a framework agreement (the Intergovernmental Geoscience Accord) calling for cooperation, consultation, joint planning and joint implementation – to maximize limited resources in the collection and dissemination of geoscientific data – exists between the federal survey and its provincial and territorial counterparts; be it resolved that the Geological Survey of Canada and the provincial and territorial geological surveys endorse as a fundamental principle of their cooperation, the mutual and efficacious sharing of all survey-held geoscientific data, information and knowledge that is not restricted by third-party interests. In the occasional item-specific circumstance where an obstacle to data sharing develops, all parties are committed to overcoming the obstacle as expeditiously as possible. This resolution will help ensure that multipurpose and dual jurisdictional applications of data may be effected for the maximum economic and social benefit of Canadians.

R. Frank Blackwood
CPG Chairman, 1997

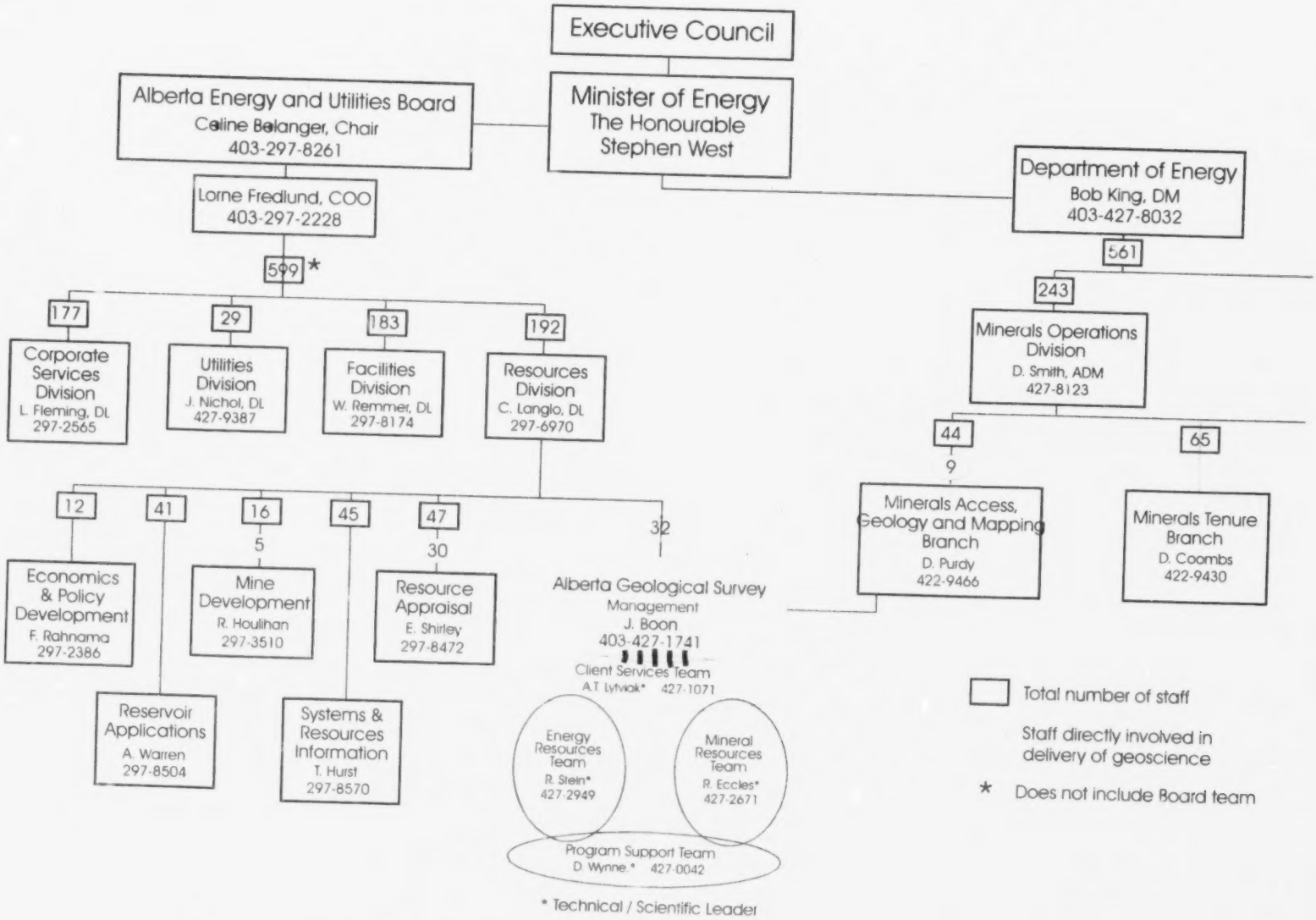
GEOSCIENCE ORGANIZATION CHARTS

Each Provincial and Territorial government in Canada has developed its own organization structure for conducting geoscientific survey and research work. Some provinces have what is formally called a Geological Survey (*e.g.*, Ontario Geological Survey), but in most jurisdictions the main elements of the geological survey function are embraced in one or more Branches of Divisions of provincial Mines/Energy/Natural Resources Departments (*e.g.*, the British Columbia Ministry of Employment and Investment has an Energy and Minerals Division, with the bulk of the geological survey and research work conducted in the Geological Survey Branch). The following organization charts are set out in standard format to help alleviate confusion among potential users of provincial geoscience services. The charts contain reference to the lines of reporting of the various units in each hierarchy, the manpower associated with each separate jurisdiction, and the names and telephone numbers of key individuals in each system.

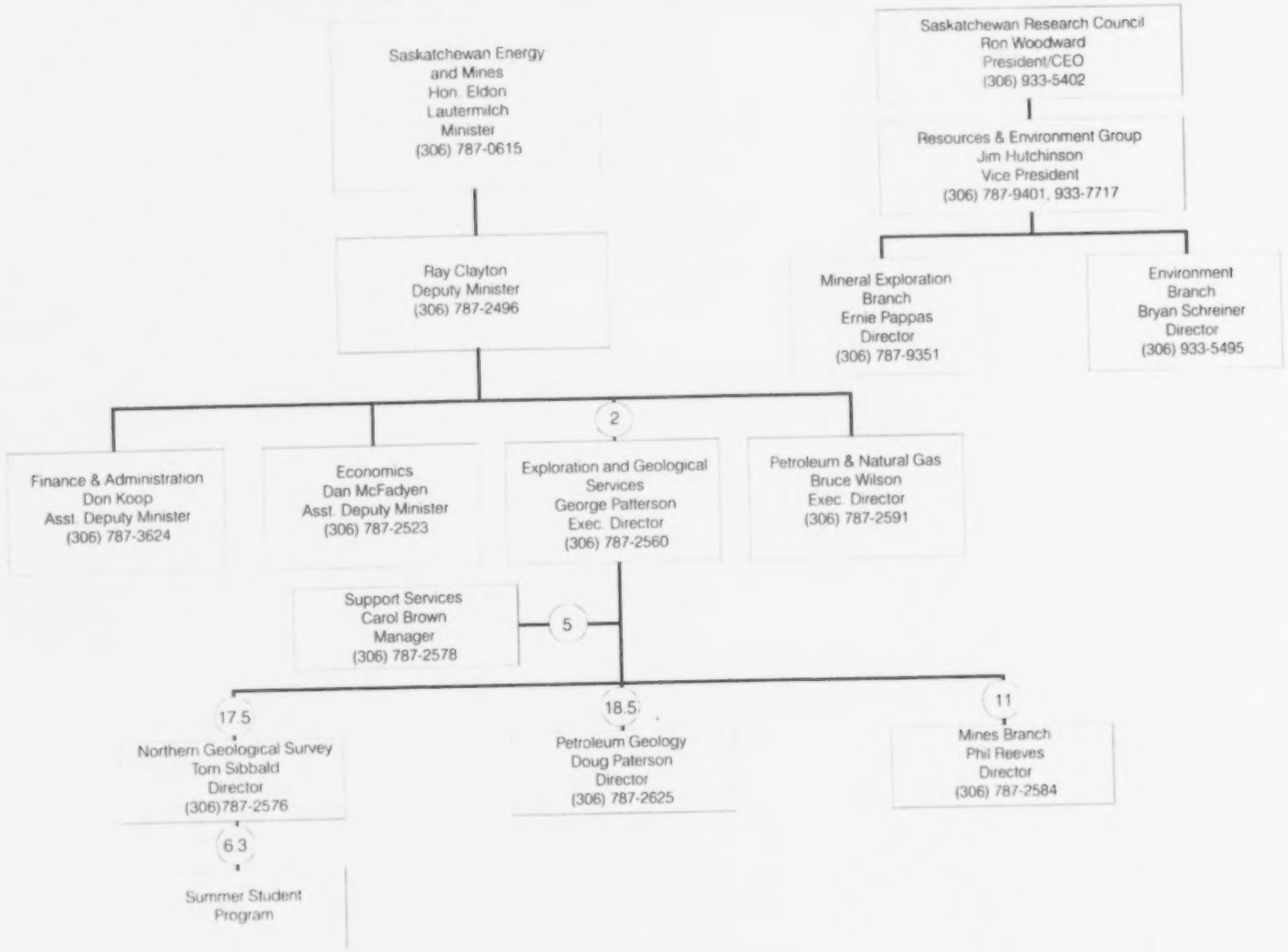
BRITISH COLUMBIA GEOSCIENCE ORGANIZATION CHART, 1997



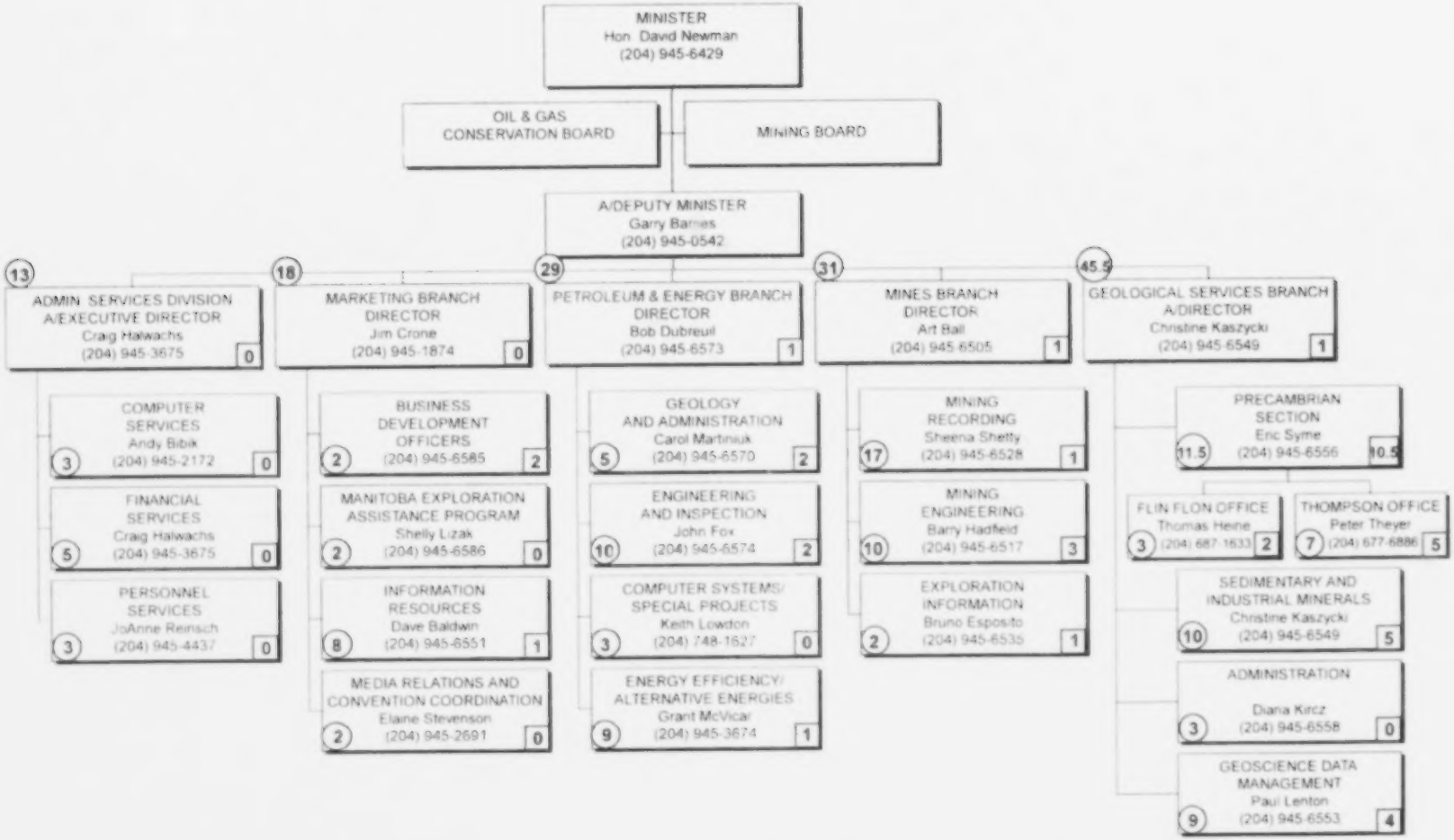
Alberta Geoscience Organization Chart (1997)



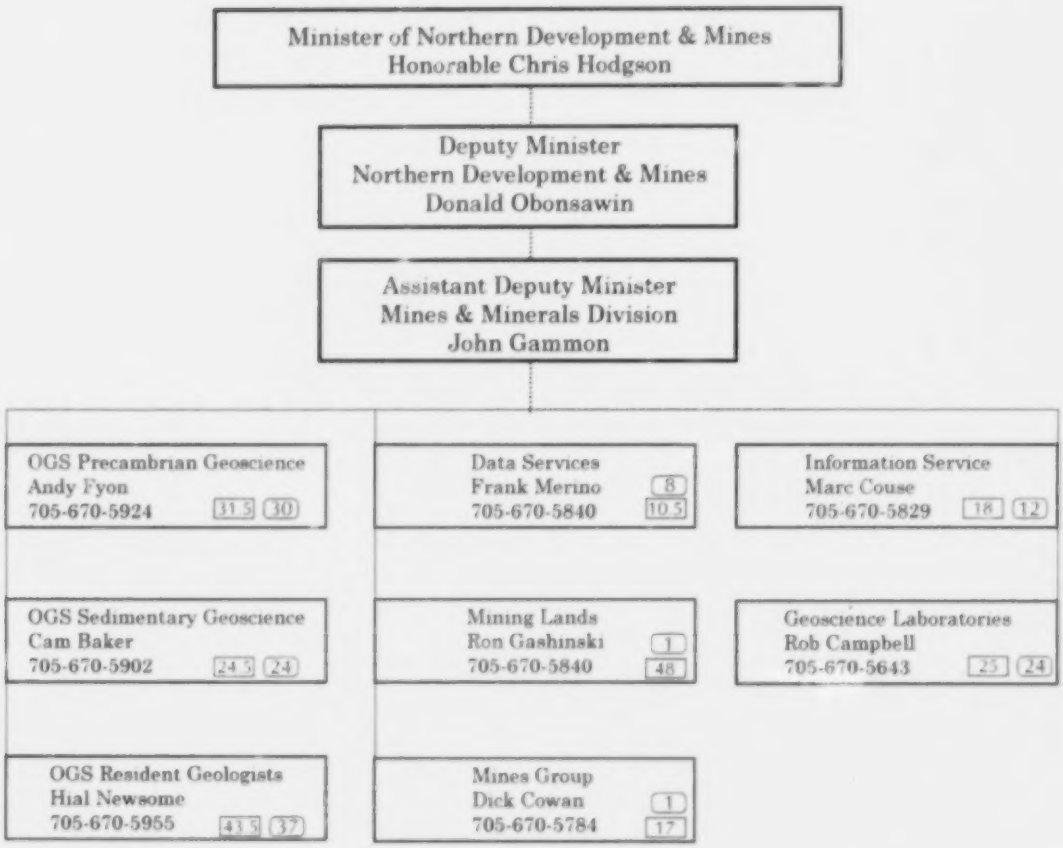
Saskatchewan Geoscience Organization Chart



MANITOBA GEOSCIENCE
ORGANIZATIONAL CHART



Ontario Mines and Minerals Division Organization Chart

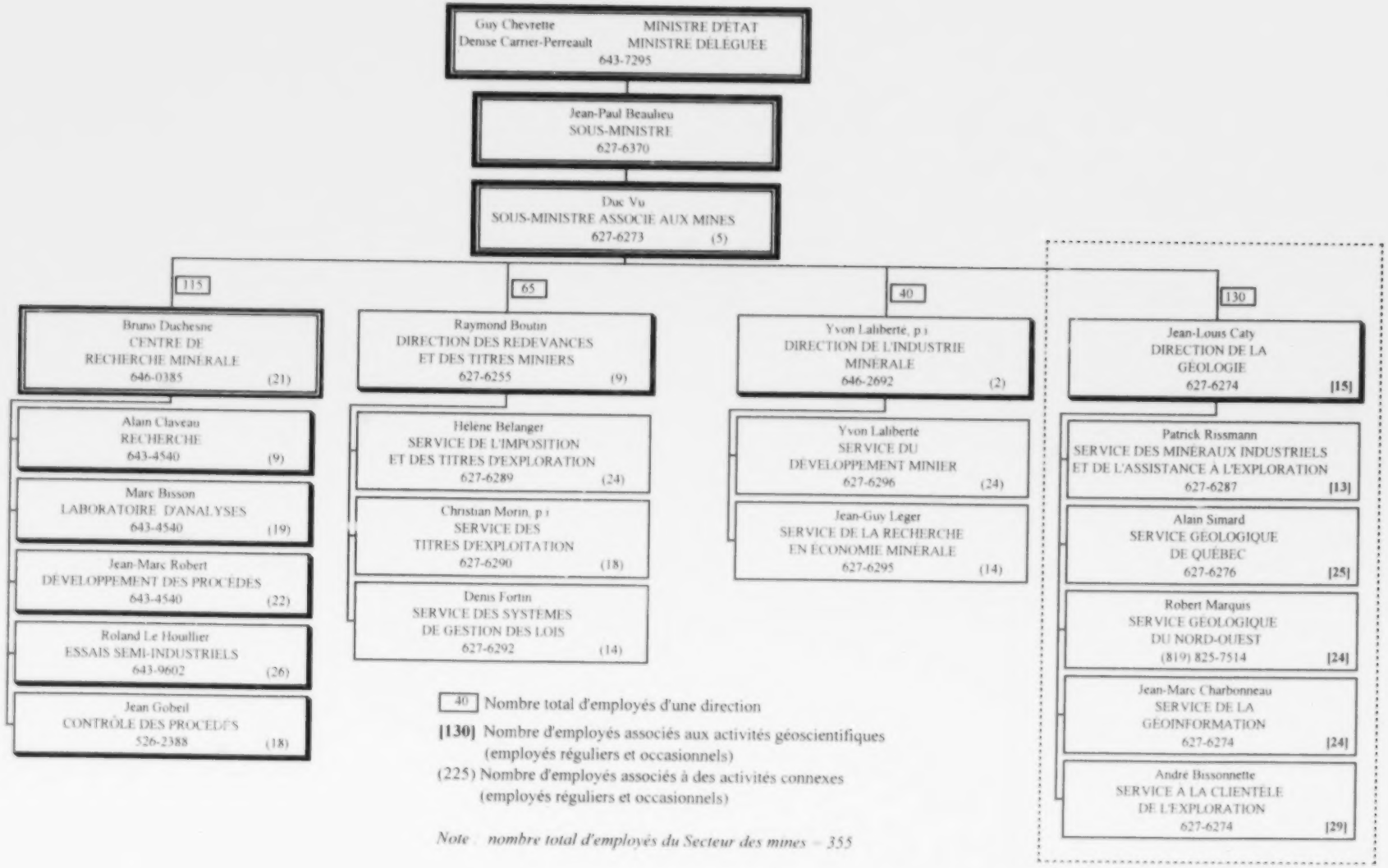


LEGEND

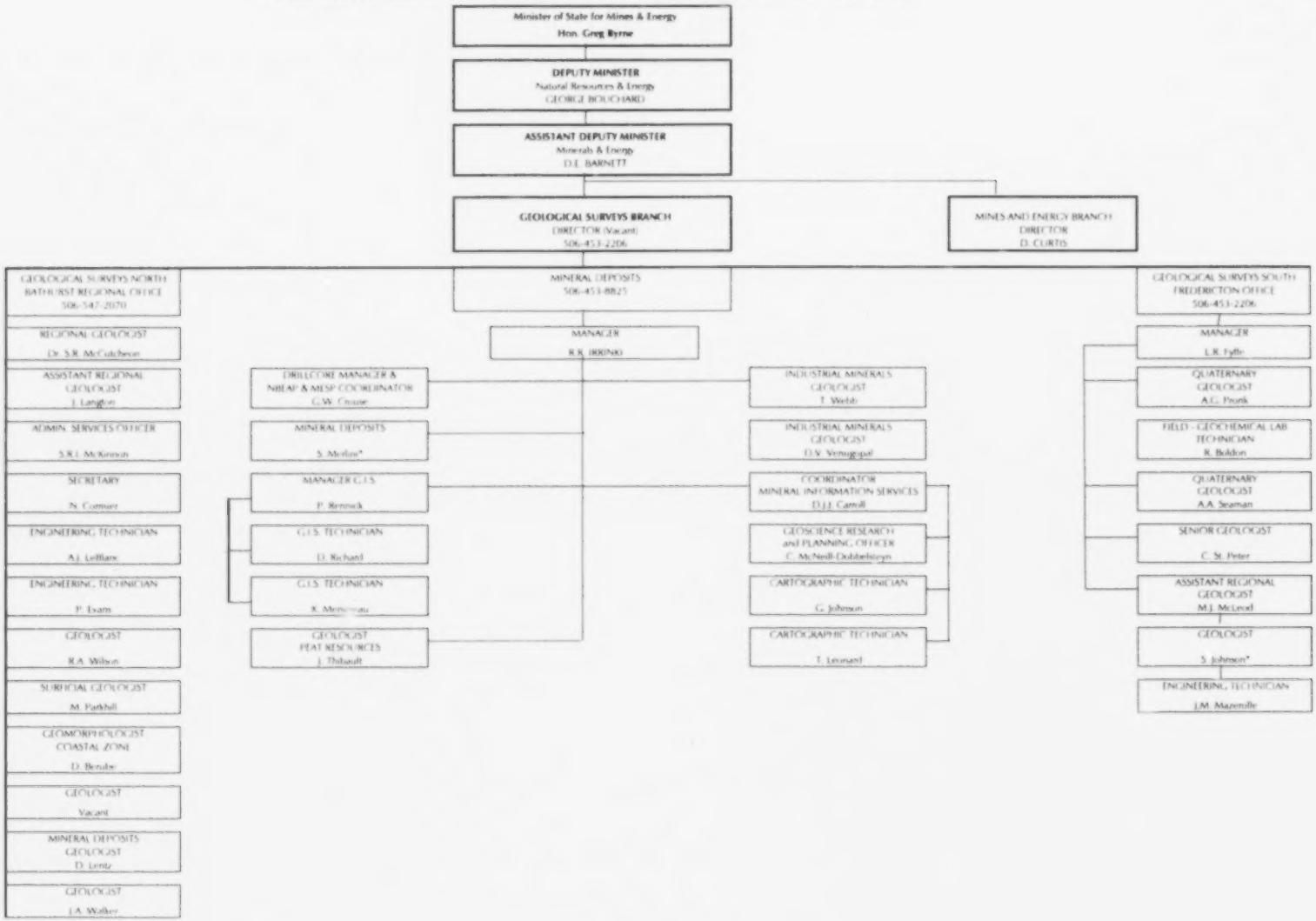
30 *Number of staff directly associated with Geoscience Activities*

31.5 *Total Staff*

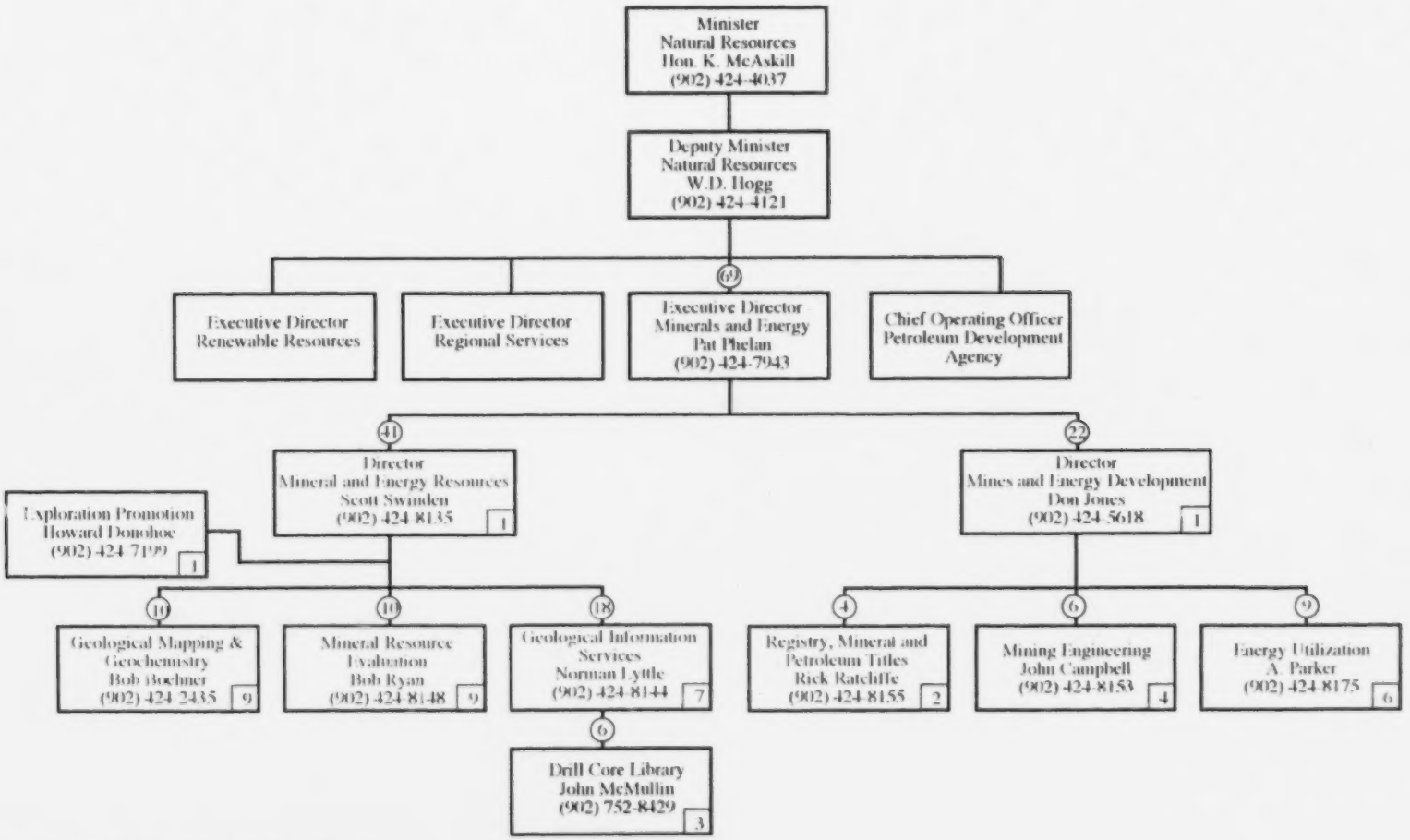
MINISTÈRE DES RESSOURCES NATURELLES - SECTEUR DES MINES



NEW BRUNSWICK DEPARTMENT OF NATURAL RESOURCES & ENERGY



NOVA SCOTIA GEOSCIENCE ORGANIZATION CHART

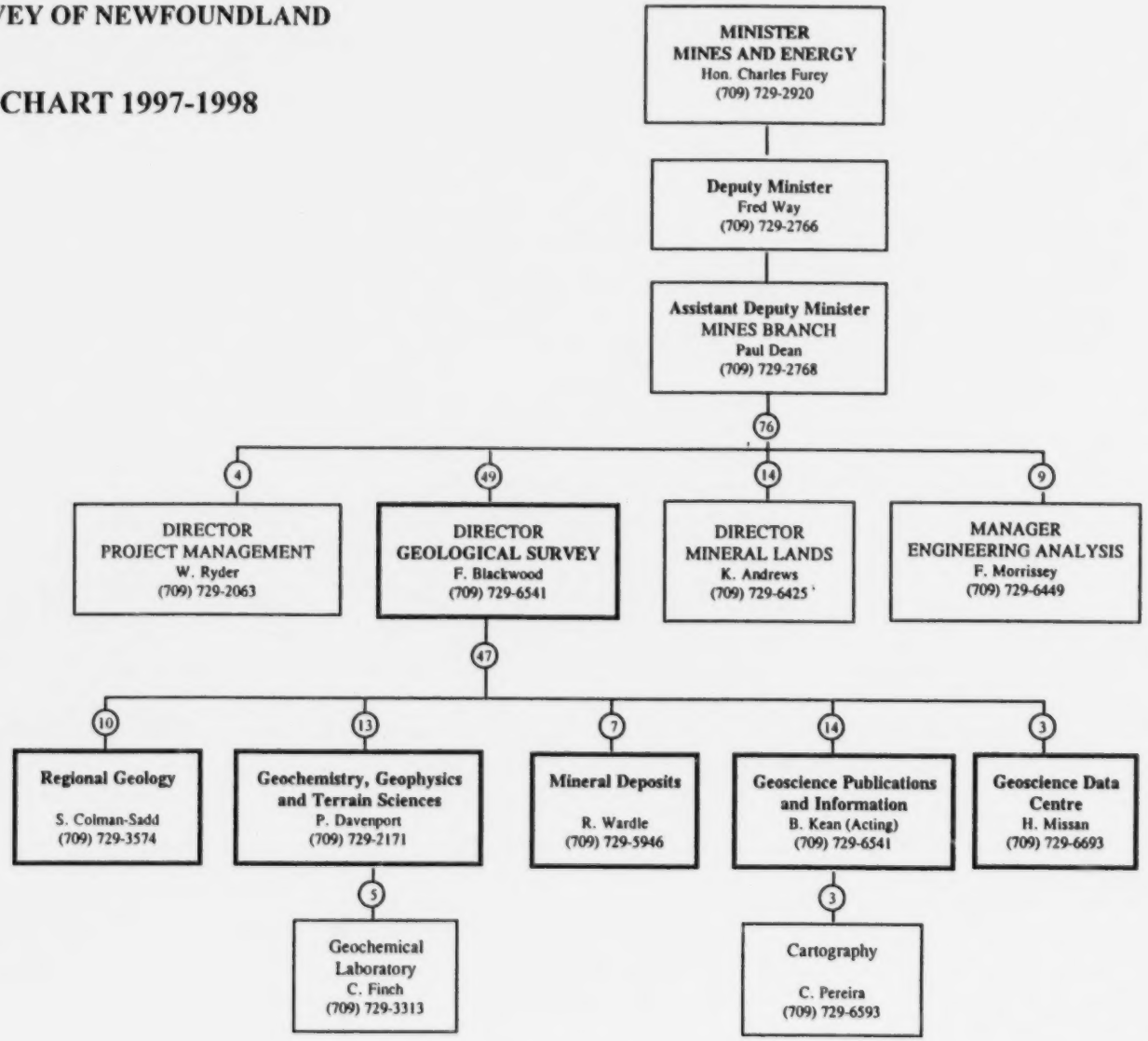


□ PROFESSIONAL (GEOLOGY, ENGINEERING)

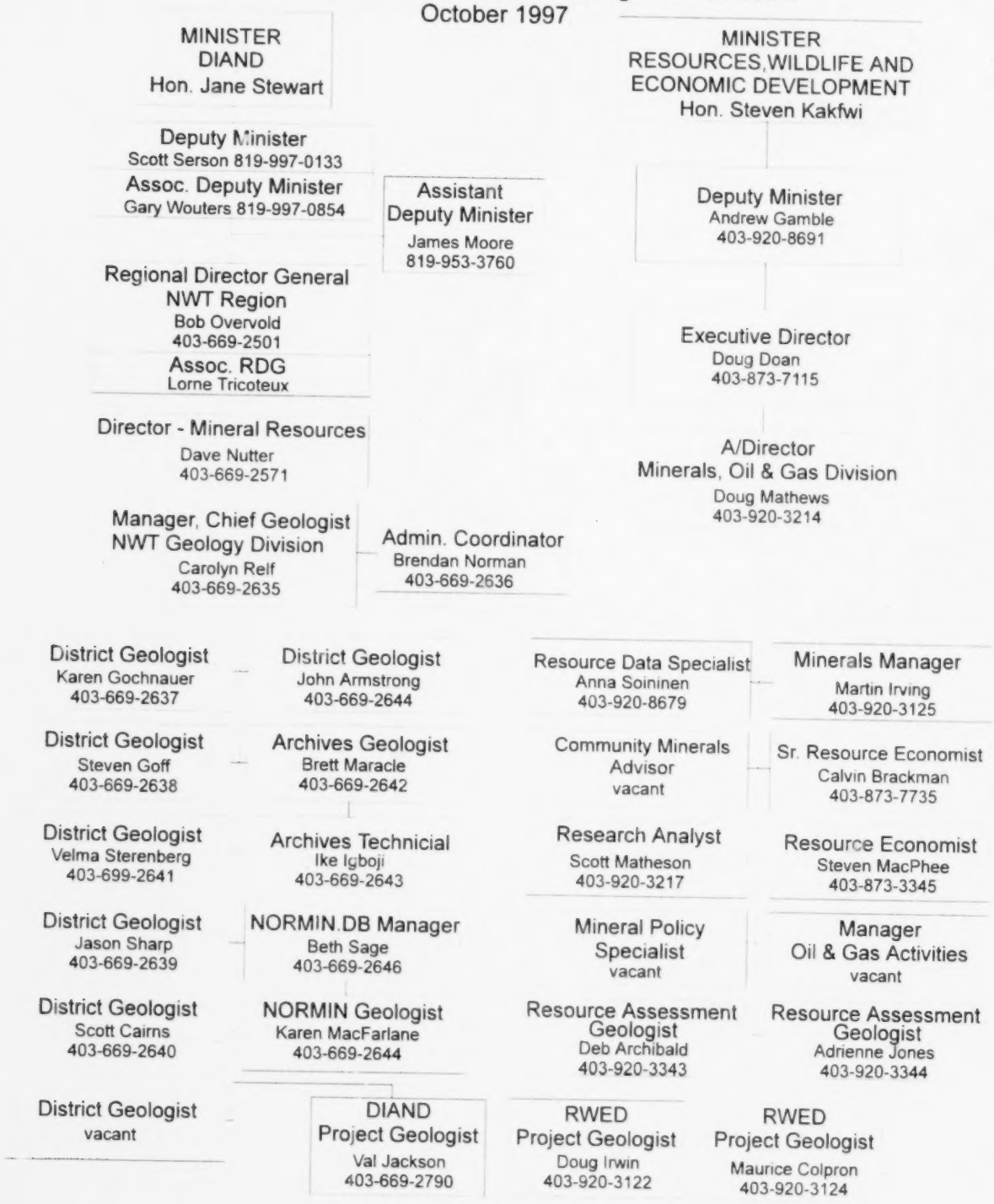
○ TOTAL STAFF (PROFESSIONAL, TECHNICAL, CLERICAL)

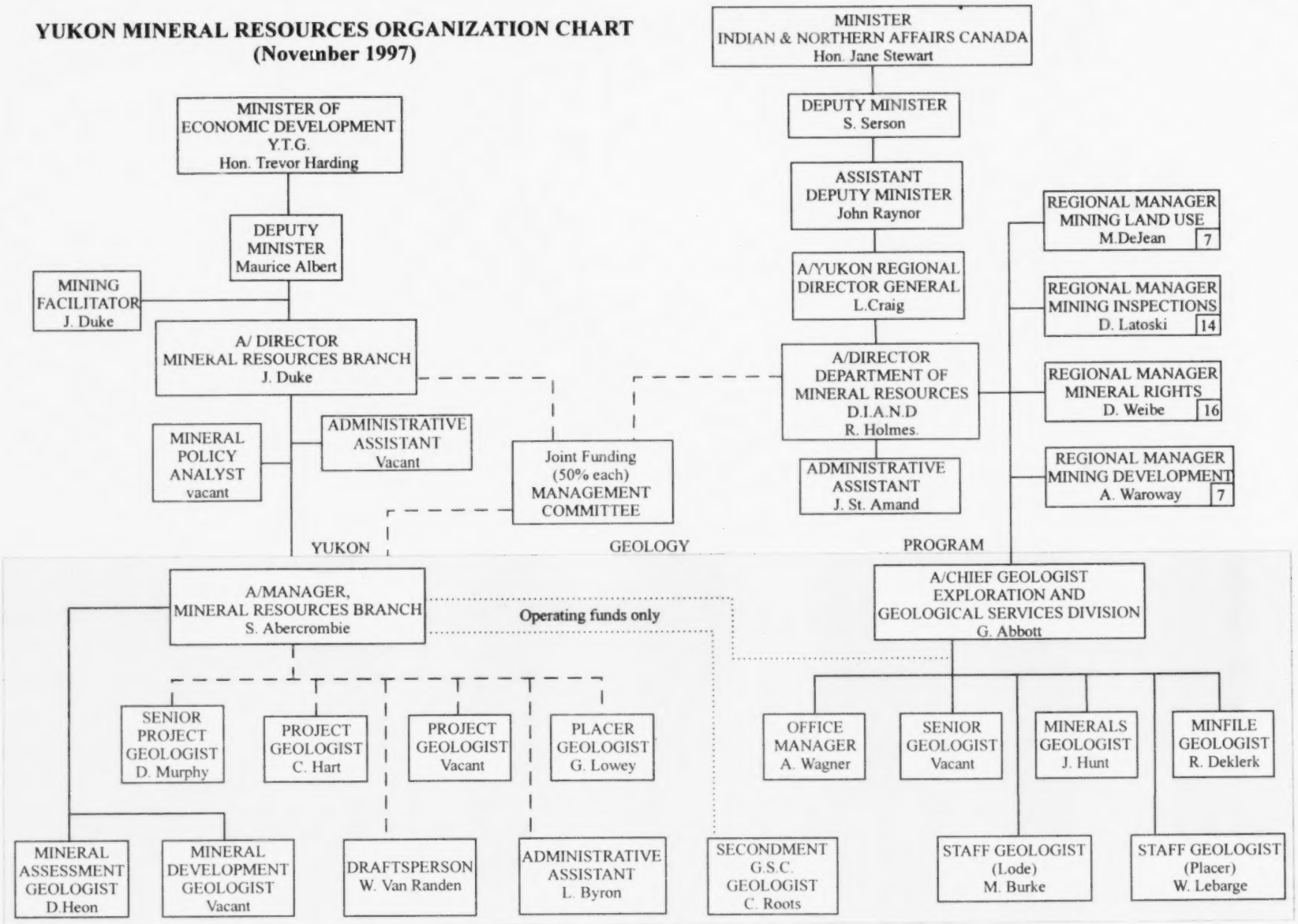
GEOLOGICAL SURVEY OF NEWFOUNDLAND AND LABRADOR

ORGANIZATION CHART 1997-1998



Northwest Territories Geoscience Organization Chart
October 1997




YUKON MINERAL RESOURCES ORGANIZATION CHART
(November 1997)
MINISTER
INDIAN & NORTHERN AFFAIRS CANADA
Hon. Jane Stewart
DEPUTY MINISTER
S. Serson
ASSISTANT
DEPUTY MINISTER
John Raynor
A/YUKON REGIONAL
DIRECTOR GENERAL
L.Craig
A/DIRECTOR
DEPARTMENT OF
MINERAL RESOURCES
D.I.A.N.D
R. Holmes.
ADMINISTRATIVE
ASSISTANT
J. St. Amand
REGIONAL MANAGER
MINING LAND USE
M.DeJean 7
REGIONAL MANAGER
MINING INSPECTIONS
D. Latoski 14
REGIONAL MANAGER
MINERAL RIGHTS
D. Weibe 16
REGIONAL MANAGER
MINING DEVELOPMENT
A. Waroway 7
MINISTER OF
ECONOMIC DEVELOPMENT
Y.T.G.
Hon. Trevor Harding
DEPUTY
MINISTER
Maurice Albert
MINING
FACILITATOR
J. Duke
A/ DIRECTOR
MINERAL RESOURCES BRANCH
J. Duke
MINERAL
POLICY
ANALYST
vacant
ADMINISTRATIVE
ASSISTANT
Vacant
Joint Funding
(50% each)
MANAGEMENT
COMMITTEE
YUKON
GEOLOGY
PROGRAM
A/MANAGER,
MINERAL RESOURCES BRANCH
S. Abercrombie
Operating funds only
A/CHIEF GEOLOGIST
EXPLORATION AND
GEOLOGICAL SERVICES DIVISION
G. Abbott
SENIOR
PROJECT
GEOLOGIST
D. Murphy
PROJECT
GEOLOGIST
C. Hart
PROJECT
GEOLOGIST
Vacant
PLACER
GEOLOGIST
G. Lowey
OFFICE
MANAGER
A. Wagner
SENIOR
GEOLOGIST
Vacant
MINERALS
GEOLOGIST
J. Hunt
MINFILE
GEOLOGIST
R. Deklerk
MINERAL
ASSESSMENT
GEOLOGIST
D.Heon
MINERAL
DEVELOPMENT
GEOLOGIST
Vacant
DRAFTSPERSON
W. Van Randen
ADMINISTRATIVE
ASSISTANT
L. Byron
SECONDMENT
G.S.C.
GEOLOGIST
C. Roots
STAFF GEOLOGIST
(Lode)
M. Burke
STAFF GEOLOGIST
(Placer)
W. Lebarge

PROVINCIAL GEOLOGICAL SURVEY EXPENDITURES
1996-1997 FINAL 1997-1998 PRELIMINARY

Provincial/Territorial Geological Survey Expenditures 1996-1997

Province/Territory	Survey Expenditures*	% of Total	1996 Provincial Mineral Production**	Survey Expenditures as percentage of Provincial Mineral Production	Area Prov/Terr km2	Survey Expenditures $/km2	Population 1996	Survey Expenditures per Capita
NEWFOUNDLAND	$3,494,573	6.4%	$934,095,000	0.37%	405,000	$8.63	552,000	$6.33
NOVA SCOTIA	$2,466,000	4.5%	$597,472,000	0.41%	55,000	$44.84	909,000	$2.71
PRINCE EDWARD ISLAND	--	--	$3,395,000	--	6,000	--	135,000	--
NEW BRUNSWICK	$2,820,300	5.1%	$924,758,000	0.30%	73,000	$38.63	738,000	$3.82
QUEBEC	$12,751,200	23.2%	$3,319,996,000	0.38%	1,541,000	$8.27	7,138,000	$1.79
ONTARIO	$13,456,500	24.5%	$5,643,612,000	0.24%	1,069,000	$12.59	10,754,000	$1.25
MANITOBA	$3,735,800	6.8%	$1,023,909,000	0.36%	650,000	$5.75	1,114,000	$3.35
SASKATCHEWAN	$2,452,273	4.4%	$5,215,467,000	0.47%	652,000	$3.76	990,000	$2.48
ALBERTA	$2,531,951	4.6%	$26,039,407,000	0.01%	661,000	$3.83	2,697,000	$0.94
BRITISH COLUMBIA	$6,459,017	11.7%	$4,248,218,000	0.15%	948,000	$6.81	3,725,000	$1.73
NORTHWEST TERRITORIES	$2,370,836	4.3%	$798,403,000	0.30%	3,380,000	$0.70	64,000	$37.04
YUKON	$2,463,100	4.5%	$423,069,000		483,000	$5.10	31,000	$79.45
Canadian Total	**$55,001,550**	**100%**	**$49,171,801,000**	**0.112%**				

* *Note:* •*Comparisons between jurisdictions are difficult due to the variety of budget/program components and methods of reporting data.*
•*Does not include expenditures on Industry Grant Programs (eg. Prospectors Assistance) see Table 2 for details on grants*
•*Expenditures column includes a total of A-base funds and MDA funds available to the geological surveys*

***Source: Natural Resources Canada: Mineral Industry Review Summer 1997*
•*Production figures include metals, non-metals, structural materials and coal.*
•*Alberta figures also include natural gas, natural gas by-products and crude oil.*

Provincial/Territorial Industry Grant Programs

(eg. Prospectors Assistance, Mineral Exploration Assistance Programs)

1996-1997 Final

Province/Territory	Industry Grant Programs
NEWFOUNDLAND	$1,341,957
NOVA SCOTIA	$74,500
PRINCE EDWARD ISLAND	
NEW BRUNSWICK	$450,000
QUEBEC	$4,804,500
ONTARIO	$4,344,300
MANITOBA	$2,283,346
SASKATCHEWAN	
ALBERTA	
BRITISH COLUMBIA	$500,000
NORTHWEST TERRITORIES	$70,000
YUKON	$572,400
Total	**$14,441,003**

Provincial Geological Survey Expenditures
1997-1998 Preliminary Estimates

Province/Territory	Survey Expenditures	% of Total	1997-1998 Industry Grant Programs	Total
NEWFOUNDLAND	$3,248,500	6.2%	$0	$3,248,500
NOVA SCOTIA	$2,466,000	4.7%	$0	$2,466,000
PRINCE EDWARD ISLAND	$0	0.0%	$0	$0
NEW BRUNSWICK	$2,770,100	5.3%	$390,000	$3,160,100
QUEBEC	$14,348,000	27.4%	$6,941,100	$21,289,100
ONTARIO	$11,000,000	21.0%	$2,000,000	$13,000,000
MANITOBA	$3,635,700	6.9%	$3,515,000	$7,150,700
SASKATCHEWAN	$2,560,000	4.9%	$0	$2,560,000
ALBERTA	$3,008,585	5.7%	$0	$3,008,585
BRITISH COLUMBIA	$4,500,000	8.6%	$500,000	$5,000,000
NORTHWEST TERRITORIES	$2,578,743	4.9%	$70,000	$2,648,743
YUKON	$2,247,100	4.3%	$506,000	$2,753,100
Canadian Total	**$52,362,728**	**100%**	**$13,922,100**	**$66,284,828**

Province: BRITISH COLUMBIA 1996-1997

	Funding Agency	# of Projects	Positions Perm	Casual	Salaries	$ Operational	Total
Mineral Activities							
Bedrock geological surveys	*GSB	7	14.25	5	$1,136,464	$761,262	$1,897,726
Geochemical surveys	GSB	6	4.25	1	$322,448	$614,982	$937,430
Surficial geology surveys	GSB	3	4.25	1	$343,182	$243,500	$586,682
Mineral deposit studies	GSB	7	6.5	2.43	$536,882	$359,199	$896,081
Mineral inventory compilations	GSB	n/a	3.5	0	$213,959	$53,500	$267,459
Industrial mineral studies	GSB	4	4	0.26	$274,884	$99,066	$373,950
Mineral resource assessments	**CRII	n/a	2.75	0	$193,134	$44,504	$237,638
Vancouver Regional Office	GSB		6				$141,228
District Geologists/Mines Branch	***MB		1	0.5	$448,724	$72,000	$379,496
Sub total		**27**	**46.5**	**10.19**	**$3,469,677**	**$2,248,013**	**$5,717,690**
Energy Activities							
Coal	GSB	2	1.5	0	$103,390	$32,833	$136,223
Sub total		**2**	**1.5**	**0**	**$103,390**	**$32,833**	**$136,223**
Other Activities							
Environmental (Hazards)	CRII/GSB		0.5	1	$104,425	$23,000	$127,425
Laboratory	GSB		1	0.15	$50,696	$11,536	$62,222
Chief's office/admin	GSB		4.5	0.25	$265,624	$104,732	$370,356
Sub total			**6**	**1.4**	**$420,745**	**$139,268**	**$560,003**
Miscellaneous							
Publications	GSB		6	0	$293,733	$57,349	$351,082
Information/ Assessment files	GSB		4	0	$216,548	$23,500	$240,048
Research grants			0	0	$0	$20,300	$20,300
Sub total			**10**	**0**	**$510,281**	**$101,149**	**$611,430**
Sub Total: Mineral Survey Activities (GSB) Reported in Table 1							**$6,459,017**
Industry Grant Programs							
Prospector assistance	MEI		1	0	$99,817	$400,183	$500,000
Sub total			**1**	**0**	**$99,817**	**$400,183**	**$500,000**
Grand total		**29**	**65**	**11.59**	**$4,603,910**	**$2,921,446**	**$6,959,017**

*Geological Survey Branch **Corporate Resource Inventory Initiative ***Mines Branch

Province: ALBERTA 1996-1997

	Agency	Funding	Projects	Person Years Perm.	Person Years Casual	Salaries ($) Perm.	Salaries ($) Casual	Operating Expenditures	Total ($)
Mineral Activities									
Geochemical Surveys	EUB	EUB	1	1.27		$79,553.25		$58,619.56	$138,172.81
Bedrock Geology	EUB	EUB	2	1.29		$87,613.93		$51,148.37	$138,762.30
Mineral Investigations (Field)	EUB	EUB	2	0.88	0.26	$48,080.17	$7,047.34	$76,530.05	$131,657.56
Mineral Deposit Analysis and/or Inventory	EUB	EUB	1	0.65		$41,695.31		$2,327.31	$44,022.62
Industrial Minerals	EUB	EUB	2	1.39		$86,855.94		$49,869.84	$136,725.78
Minerals Infomaton Systems	EUB	EUB	1	0.44		$27,106.79		$425.34	$27,532.13
Core Repositories	EUB	EUB	1	0.38		$21,603.03		$8,699.55	$30,302.58
Energy Activities									
Oil, Gas, and Coal	EUB	EUB	2	2.45		$133,074.20		$90,545.86	$223,620.06
Other Activities									
Environmental/Land Use	EUB	EUB	2	0.84		$41,866.35		$43,272.06	$85,138.41
Hydrogeology	EUB	EUB	2	2.55		$160,005.15		$185,917.03	$345,922.18
Geoscience Information System	EUB	EUB	2	1.98		$95,714.06		$333,582.02	$429,296.08
Chief's Office/Administration	EUB	EUB	2	5.63	0.08	$352,848.00	$3,690.53	$146,635.49	$503,174.02
Laboratories	EUB	EUB	1	0.13		$7,073.80		$2,719.45	$9,793.25
Miscellaneous									
Library	EUB	EUB	1	0.43		$17,680.00		$38,009.60	$55,689.60
Publication/Data Sales	EUB	EUB	1	2.26		$113,956.33		$82,215.47	$196,171.80
Other	EUB	EUB	2	0.48		$24,214.52		$11,755.32	$35,969.84
Grand Total			**25**	**23.05**	**0.34**	**$1,338,940.83**	**$10,737.87**	**$1,182,272.32**	**$2,531,951.02**

Province: SASKATCHEWAN 1996-1997

		Positions #py's		Salaries $		Operational	Total
	#Projects	Permanent	Non-permanent	Permanent	Non-permanent	$	$
Mineral Activities							
Bedrock Geology Survey	4	4	2.9	$264,887.00	$97,238.00	$170,364.00	$532,489.00
Geochemical Survey	1	0	0	$0.00	$0.00	$12,500.00	$12,500.00
Geophysical Survey	1	0	0	$0.00	$0.00	$5,000.00	$5,000.00
Mineral Investigations	2	0.8	0.1	$51,617.00	$1,957.00	$8,003.00	$61,577.00
Mineral Deposit Inventory	1	1	0	$51,540.00	$0.00	$5,142.00	$56,682.00
Industrial Mineral Studies	2	2	0.7	$72,213.00	$15,135.00	$27,799.00	$115,147.00
District Geologists	n/a	2	0	$103,830.00	$0.00	$25,000.00	$128,830.00
Core Depositories	1	0	0.3	$0.00	$7,864.00	$9,744.00	$17,608.00
Mineral Resource Assessment	1	0.8	0	$35,415.00	$0.00	$3,307.00	$38,722.00
Energy Activities							
Coal/peat	0	0	0	$0.00	$0.00	$0.00	$0.00
Oil/gas	n/a	4	5.5	$134,490.00	$112,914.00	$13,572.00	$260,976.00
Core Depositories	1	6	4.5	$158,957.00	$100,154.00	$17,703.00	$276,814.00
Subsurface Analysis	3	4	0	$254,076.00	$0.00	$16,200.00	$270,276.00
Other Activities							
Environmental/land use	0	0	0	$0.00	$0.00	$0.00	$0.00
Hydrogeology	0	0	0	$0.00	$0.00	$0.00	$0.00
Laboratories	0	0	0	$0.00	$0.00	$0.00	$0.00
Miscellaneous(Service/support)	0	0	0	$0.00	$0.00	$0.00	$0.00
Chief's Office/Administration	n/a	3	0.4	$168,205.00	$8,295.00	$73,606.00	250106
Miscellaneous							
Library	0	0	0	$0.00	$0.00	$0.00	$0.00
Publications	n/a	3	1	$130,040.00	$42,708.00	$39,663.00	$212,411.00
Information/Assessment Files	n/a	1	1.7	$60,096.00	$41,370.00	$16,142.00	$117,608.00
Research Grants	0	0	0	$0.00	$0.00	$0.00	$0.00
Other- GIS/Computerization	n/a	1	1	$53,898.00	$21,455.00	$20,174.00	$95,527.00
Grand Total		**32.6**	**18.1**	**$1,539,264.00**	**$449,090.00**	**$463,919.00**	**$2,452,273.00**

Province: MANITOBA 1996-1997

	Survey Research Agency	Funding Agency	No. of Projects/or Facilities	Permanent SMY	Casual/ Term SMY	Salaries Permanent $	Salaries Casual $	Operating Expenditures $	Total
Mineral Activities									
Bedrock Geology Surveys	MGS	MAN	33	11.26	1.35	$670,600	$27,700	$244,000	$942,300
Geochemical Surveys	MGS	MAN	1	2.00	0.26	$127,500	$14,600	$250,400	$392,500
Surficial Geology Surveys	MGS	MAN	2	1.00	0.12	$54,300	$3,400	$18,100	$75,800
Geophysical Surveys	MGS	MAN	1	1.00		$61,500		$500	$62,000
Mineral Investigations (Field)	MGS	MAN	8	3.00	1.27	$188,700	$32,100	$9,500	$230,300
Mineral Deposit Analysis/ Inventory	MGS	MAN	0					$0	$0
Industrial Minerals	MGS	MAN	3	1.26	0.30	$82,700	$9,000	$23,600	$115,300
District Geologists	MGS	MAN	4	4.26		$216,900		$49,700	$266,600
Core Repositories	MGS	MAN	6	1.00		$39,600	$0	$8,000	$47,600
Other Activities									
Environment/Land Use Hydrology	MGS	MAN	1					$7,400	$7,400
Laboratories	MGS	MAN	4	8.00		$379,300	$8,400	$55,400	$443,100
Miscellaneous Activities	MGS	MAN	4	8.26		$376,200		$105,200	$481,400
Chiefs Office/Administration	MGS	MAN	7	6.00	0.04	$253,100	$1,000	$417 00	$671,500
Total Reported in Table 1			**74**	**47.04**	**3.34**	**$2,450,400**	**$96,200**	**$1,189,200**	**$3,735,800**
Industry Grant Programs									
Prospector assistance									$83,346
MEAP									$2,200,000
Grand Total			**74**	**47.04**	**3.34**	**$2,450,400**	**$96,200**	**$1,189,200**	**$6,019,146**

Province: ONTARIO 1996-1997

	Funding Agency	No. of Projects or Facilities	Staff Permanent (person/yrs)	Staff Contract (person/yrs)	Salaries	Operating Expenditures* (incl benefits)	Totals
Mineral Activities							
Bedrock Geology Surveys	MNDM	16	14.5	3.5	$1,003,500	$530,000	$1,533,500
Geochemical Surveys	MNDM	3	5.5	1	$372,000	$225,000	$597,000
Surficial Geology Surveys	MNDM	6	7.5	1.5	$511,000	$310,000	$821,000
Mineral Investigations (field)	MNDM	3	4.5	1	$307,000	$220,000	$527,000
Mineral Deposit Analysis and/or Inventory	MNDM	2	1.5		$81,000	$29,000	$110,000
Industrial Minerals	MNDM	3	4.5	0.5	$261,500	$72,000	$333,500
District Geologists	MNDM	13	48		$2,368,000	$707,900	$3,075,900
Core Repositories	MNDM	6	2		$95,000	$45,000	$140,000
Other Activities							
Environment/Land Use	MNDM		1		$55,000	$27,700	$82,700
Laboratories	MNDM		12	12	$1,023,000	$713,000	$1,736,000
Miscellaneous							
Library	MNDM		1		$35,300	$39,000	$74,300
Publications	MNDM		8		$363,500	$245,000	$608,500
Data Services	MNDM		10.5		$511,200	$961,600	$1,472,800
Total		**52**	**120.5**	**19.5**	**$6,987,000**	**$4,125,200**	**$11,112,200**
NODA	CAN/ONT	21	6	8	$653,300	$1,691,000	$2,344,300
Sub Total Reported in Table 1		**73**	**126.5**	**27.5**	**$7,640,300**	**$5,816,200**	**$13,456,500**
Industry Grant Programs							
Prospector's Assistance	MNDM/ OPAP					$2,000,000	$2,000,000
Grand Total		**73**	**126.5**	**27.5**	**$7,640,300**	**$7,816,200**	**$15,456,500**

Province: QUÉBEC 1996-1997

	Funding Agency	No. of Projects	Employees (Full time equivalents) Perm	Casual term	Contract	Salaries $ Perm	Casual	Contract	Operating Expenditures $	Totals $
Mineral Activities										
* Bedrock geology surveys	MRN-EADM	15	23.2	9.6	12	$1,108,600	$213,500	$621,000	$2,955,800	$4,898,900
* Geochemical surveys/studies	MRN-EADM	19	2.1			$116,200			$15,300	$131,500
* Geophysical surveys/studies	MRN-EADM	16	1.0		0.8	$57,600		$18,000	$777,500	$853,100
* Mineral investigations (field)	MRN-EADM	17	5.5	2.2	2.3	$307,900	$38,700	$71,000	$320,200	$737,800
* Mineral deposit analysis	MRN-EADM	2	1.6	0.6	0.1	$71,700	$31,600		$42,100	$145,400
* Industrial minerals	MRN-EADM	17	3.8	0.3		$213,000	$4,600		$42,200	$259,800
* District geologists	MRN-EADM	1	28.8	3.0		$1,068,100	$80,100		$258,800	$1,407,000
Other Activities										
* Chief geologist's Office/ Administration	MRN-EADM	2	18.4	0.3		$780,000	$9,200		$495,500	$1,284,700
Miscellaneous										
* Publications	MRN-EADM		8.4			$377,200			$246,500	$623,700
* Information/ Assessment files	MRN-EADM		8.3			$438,400			$197,900	$636,300
* Other (GIS-Sigeom)	MRN-EADM		4.9	0.8		$162,000	$46,800		$1,564,200	$1,773,000
Sub Total Reported in Table 1		**89**	**106**	**16.8**	**15.2**	**$4,700,700**	**$424,500**	**$710,000**	**$6,916,000**	**$12,751,200**
Industry Grant Program										
* Prospectors/Companies Assista	MRN-EADM	232	2.1	0.8		$101,400	$43,100		$4,660,000	$4,804,500
Grand Total		**321**	**108.1**	**17.6**	**15.2**	**$4,802,100**	**$467,600**	**$710,000**	**$11,576,000**	**$17,555,700**

MRN = Ministère des Ressources naturelles
EADM= Entente auxiliaire Canada-Québec sur le développement minéral

Province: NEW BRUNSWICK 1996-1997

	No. of Projects	Staff			Salaries	Operating	Total
		Perm	Casual	Contract			
Geological Surveys Branch							
Bedrock Geology	5	4	1.9		$278,700	$114,700	$393,400
Surficial Geology and Till Geochemistry	4	4			$193,000	$46,200	$239,200
Mineral Deposits	4	3.5	0.6		$163,650	$115,550	$279,200
GIS and Digital Technology	4	3.5			$134,150	$118,750	$2,529,001
Regional Geologist	2	6			$264,500	$81,600	$346,100
Drill Core	3	1	1		$84,100	$33,200	$1,173,002
Editorial	1	1			$47,500	$5,900	$53,400
Directors Office	1	1			$99,200	$7,800	$107,000
Geophysics (Airborne)	1					$460,000	$4,600,003
Mineral Development Branch							
Industrial Minerals	4	4			$194,300	$38,800	$233,100
Publications Education	3	6			$215,900	$51,500	$267,400
Energy Branch							
Oil, Gas, Oil Shale	1	1	0.2		$58,200	$13,100	$71,300
Sub Total Reported in Table 1	**33**	**35**	**3.7**		**$1,733,200**	**$1,087,100**	**$2,820,300**
Industry Grant Programs							
Prospectors Assistance (MESP)	1					$50,000	$50,000
Exploration Assistance (NBEAP)	1					$400,000	$4,000,003
Grand Total	**35**	**35**	**3.7**		**$1,733,200**	**$1,537,100**	**$3,270,300**

1 Includes $60,000 funding from N.B. Regional Development Corporation

2 Includes $55,000 funding from N.B. Department of Natural Resources and Energy Development Fund

3 Entire funding from Canada-New Brunswick Cooperation Agreement on Economic Diversification

Province: NOVA SCOTIA 1996-1997

	Survey Research Agency	Funding Agency	No. Projects or Facilities	Staff		Operating Expends	Salaries	Total
				Perm	Casual*			
Mineral Activities								
Bedrock Geology Surveys	MERD	NSDNR	4	4.4		$79,600	$211,700	$291,300
Geochemical Surveys	MERD	NSDNR	1	2.3		$57,800	$83,300	$141,100
Surficial Surveys	MERD	NSDNR	2	2.3		$38,900	$98,800	$137,700
Geophysical Surveys	MERD	NSDNR						
Mineral Investigations (Field)	MERD	NSDNR	4	5.25		$84,000	$210,000	$294,000
Mineral Deposit Analysis/Inventory	MERD	NSDNR	2	2.25		$52,100	$88,900	$141,000
Industrial Minerals	MERD/MEDD	NSDNR	3	1.25		$34,700	$47,600	$82,300
District Geologists	RSD	NSDNR	3					
Core Repositories	MERD	NSDNR	1	6	0.3	$79,800	$238,900	$318,700
Energy Activities								
Coal/Peat	MERD	NSDNR	8	3.25		$63,300	$140,500	$203,800
Oil and Gas	PDA	NSDNR						
Core Repositories	PDA	NSDNR						
Subsurfact Analysis	PDA	NSDNR						
Other Activities								
Environmental/Land Use	MERD	NSDNR	2	2.4		$26,500	$102,200	$128,700
Hydrology	DOE							
Laboratories								
Misc. Activities	MERD	NSDNR						
Chief Geol's Office/Admin.	MERD	NSDNR		3	1	$85,900	$161,600	$247,500
Miscellaneous								
Library	PS	NSDNR						
Publications	MERD	NSDNR		3.4	0.5	$65,700	$106,200	$171,900
Public Awareness/Prospectors Training	MERD	NSDNR		1.4		$21,800	$62,100	$83,900
Information/Assessment Files	MERD	NSDNR		1.4		$17,900	$56,600	$74,500
Research Grants								
Information Technology	MERD	NSDNR		2.4		$45,800	$103,800	$149,600
Total			**30**	**41**	**1.8**	**$753,800**	**$1,712,200**	**$2,466,000**

Budget figures for MERD only
** - not including summer students*
MERD - Mineral and Energy Resources Division
MEDD - Mines and Energy Development Division
RSD - Regional Services Division
PDA - Petroleum Development Agency
PS - Planning Secretariat
DOE - Department of the Environment

Province: NEWFOUNDLAND 1996-1997

	Survey Research Agency	Funding Agency	No. of Projects/ Facilities	Perm SMY	Casual SMY	Salaries Perm $	Salaries Contract1 $	Salaries Casual $	Operating Expends $	Totals $
Mineral Activities										
Bedrock geology surveys	GSNL	NDME	12	13	3	$594,312	$12,694	$41,733	$209,706	$858,445
Geochemical surveys	GSNL	NDME	4	4	1	$162,978	$7,410	$16,467	$105,702	$292,557
Surficial geology surveys	GSNL	NDME	5	4	1	$172,364		$8,591	$32,517	$213,472
Geophysical surveys	GSNL	NDME	1	1		$47,520			$5,168	$52,688
Mineral investigations (field)	GSNL	NDME	5	5	1	$229,031		$4,195	$92,924	$326,150
Mineral deposit analysis and/or inventory	GSNL	NDME	1	3		$119,682			$700	$120,382
Industrial minerals	GSNL	NDME	3	4	1	$154,650	$5,253	$4,933	$16,347	$181,183
District geologists										
Core repositories	MLD	NDME	1	2		$97,577		$10,121	$60,964	$168,662
Energy Activities										
Coal/Peat										
Oil & Gas	EB	NDME	3	15		$678,300	$46,700		$156,200	$881,200
Core Repositories										
Subsurface Analysis										
Other Activities										
Environment/Land Use	MLD	NDME	1	2		$85,733			$16,743	$102,476
Hydrology										
Laboratories	GSNL	NDME	1	6		$216,996			$57,051	$274,047
Miscellaneous Activities										
Director's Office/Admin.	GSNL	NDME	1	5		$188,365		$3,524	$219,749	$411,638
Miscellaneous										
Library	GSNL	NDME	1	2	1	*34,007		$3,330	$7,270	$44,607
Publications/Cartography	GSNL	NDME	2	10		$296,151	$11,498		$61,276	$368,925
Information/Assessment files	GSNL	NDME	4	4		$180,471			$37,332	$217,803
Research Grants										
Information Technology	GSNL	NDME	1						$132,676	$132,676
Sub Total			**46**	**80**	**8**	**$3,258,137**	**$83,555**	**$92,894**	**$1,212,325**	**$4,646,911**
Total Geological Survey Activities Reported in Table 1										**$3,494,573**
Industry Grant Programs										
Prospectors Assistance	MB	NDME	1	1		$50,183			$139,436	$189,619
Grand Total						**$3,308,320**	**$83,555**	**$92,894**	**$1,351,761**	**$4,836,530**

GSNL - Geological Survey of Newfoundland and Labrador
MLD - Mineral Lands Division
MB - Mines Branch
EB - Energy Branch
1 - includes long-term temporary staff
** - includes $20,493 (opening doors program)*
NDME - Newfoundland Department of Mines and Energy

Territory: NORTHWEST TERRITORIES 1996-1997

	Funded by	Projects	PY's	Salary	O&M	Total
Mineral Activities						
Bedrock geology surveys	INAC	2	2.9	$64,000	$203,806	$267,806
	GNWT	4	6.5	$390,000		$390,000
Mineral investigations (field)	INAC	2			$76,530	$76,530
	GNWT					
Mineral deposit analysis	INAC					
and/or inventory	GNWT					
District Geologists	INAC		5	$272,000		$272,000
Core repositories	INAC	1	0.1	$5,000	$15,000	$20,000
Other Activities						
Chief Geologists Office/Admin	INAC		2	$117,000	$339,000	$456,000
Computerized Mineral						
Showings Database	INAC	1	1.7	$96,000	$10,500	$106,500
	GNWT					
Miscellaneous						
Library	INAC	1			$13,000	$13,000
Archives/Assessment Files	INAC	1	3	$146,000	$18,000	$164,000
Publications			0.2	$10,000	$5,000	$15,000
Research Grants/Contracts	INAC	13			$520,000	$520,000
Other (Education/Information)	GNWT					
Sub Total Reported in Table 1		**25**	**21**	**$1,100,000**	**$1,200,836**	**$2,300,836**
Industry Grant Programs						
Prospectors Assistance/Support	GNWT	1			$70,000	$70,000
Grand Total		**26**	**21**	**$1,100,000**	**$1,270,836**	**$2,370,836**

Territory: YUKON 1996-1997

	Agency	Funding	Projects	Perm	Casual	Expenditure
Mineral Activities						
Bedrock Geological Surveys	YTG	INA/YTG	2	1.25	0.5	$209,200
	INA	INA/YTG	1	1	0	$92,800
	GSC	INA/YTG/GSC	1	1	0.25	$94,200
Mineral Deposit Studies	INA	INA/YTG	1	1	0.25	$136,400
	YTG	INA/YTG	1	1	0.5	$141,600
Geochemical Surveys	GSC	INA/YTG	1	0	0	$16,400
Surficial Geology	YTG	INA/YTG	1	0	0.25	$104,600
	INA	INA	1	1	1	$207,000
	GSC	INA/YTG/GSC	1	0	0	$43,000
Geophysical Surveys	GSC	INA/YTG	1	0	0	$178,000
Mineral Resource Assessments	YTG	YTG	2	1	0	$143,500
Mineral Deposit Inventory	INA	INA	1	0.75	0.25	$67,400
District Geologists	INA	INA	1	1	0	$68,000
Core Repositories	INA	INA	1	0.25	0.25	$17,500
Energy Activities						
Oil & Gas Resource Assessments	YTG/NEB	NEB	2	0	0	$90,000
Other Activities						
Environment/Land Use	INA	INA	2	1	0	$123,000
Chief Geologist/Administration	YTG	INA/YTG	1	1	0	$221,300
	YTG	YTG	1	1	0	$87,300
	INA	INA	1	1.5	0	$206,600
Library	INA	INA	1	0	0	$15,000
Publications	INA	INA	1	0.5	0.25	$20,000
	YTG	INA/YTG	1	1	0	$102,900
Assessment Files	INA	INA	1	0.25	0	$5,000
Economic Analysis	YTG	YTG	1	1	0	$72,400
Sub Total Reported in Table 1			**28**	**16.5**	**3.5**	**$2,463,100**
Industry Grant Programs						
Prospectors' Assistance	YTG	YTG	1	1	0	$572,400
Grand Total			**29**	**17.5**	**3.5**	**$3,035,500**

OVERVIEW

1997 was a turbulent year for the GSB. In late 1996 it was announced that the Branch would be downsized in 1997 as a result of a cross-Government program review. The number of staff was reduced from 65 to 45 and the budget from $6.6 million to $3.6 million. Early in the 97/98 fiscal year $960,000 of Ministry funds were reallocated to the branch to boost the field program and to strengthen the Vancouver office. The total budget in 97/98 was $4.5 million.

As a result of the downsizing the Branch restructured into three sections:

- Mapping and Resource Evaluation;
- Economic Geology and Mineral Inventory;
- Exploration Services and Information.

A number of programs and services were eliminated, including lapidary, drafting services and in-house desktop publishing. Other programs were reduced including earthquake hazard mapping, clerical work associated with auditing Assessment Reports, and assistant geologist support outside of the field season.

A number of senior staff opted to take an early retirement incentive program, others found employment in industry or were employed elsewhere in Government. Although the overall capability of the Branch has been reduced, the scientific capability was largely retained and core programs maintained. The internal budget reallocation permitted delivery of a significant field program.

A new Geoscience Partnership Program with external clients was initiated in 1997 to maximize field surveys to improve BC's geoscience exploration database. Two partnership projects with industrial partners were delivered in 1997.

1997 was a good year for new mine openings including two open-pit, porphyry mines: the Huckleberry copper-molybdenum mine and the Mount Polley copper-gold mine and a heap leach gold operation — Golden Bear. The latter was a former conventional producer. A mill expansion was completed at the Eskay Creek mine. Construction of the Kemess South porphyry gold-copper mine was 75% complete at year end and start up is projected for the spring of 1998.

The exploration focus continued to be for gold enriched porphyries, VMS deposits and gold deposits. Coal production increased in 1997 to about 27 million tonnes. Coal represents about 37% of the value of solid mineral production. Coal exploration increased in 1997, especially for thermal coal.

PROGRAM HIGHLIGHTS FOR 1997

Economic Development Program

The Branch's economic development surveys focused on under-explored frontier regions and on areas with established mining infrastructure. Highlights include:

- Continuation of the Nechako Plateau NATMAP project, which is a collaborative effort with the Geological Survey of Canada and various universities. The focus of GSB work is the Babine porphyry belt with its important mineral potential.
- Regional geochemical sampling of the Mesilinka River Map Sheet (94C) in east central British Columbia.
- Year two of the multidisciplinary Eagle Bay Project which is utilizing surficial geology and geochemistry to look for buried mineral deposits in the Adams Plateau area.
- The Moyie industrial partnership project which will result in new 1:50 000 scale compilation maps for areas underlain by the Aldridge Formation.
- The Devono-Mississippian VMS project which continued to test potential extensions of strata that host the Kudz Ze Kayah and Wolverine deposits into northern British Columbia.
- The McConnell Range regional mapping project which extended existing coverage of the Toodoggone volcanic belt southward from the area of the Kemess deposit.
- Examination of a number of mineral deposits and deposit types including a stratabound zinc deposit in the Caribou terrane, an epithermal gold deposit in northernmost British Columbia, nickel mineralization in the Turnagain Alaskan ultramafic complex, sediment-hosted gold mineralization near Watson Bar and mineral occurrences near Bella Coola.

Resource Management Program

The five-year project to reassess the mineral potential of the Province at 1:250 000 scale in support of Government's land planning programs was completed in 1997 with assessment of the Queen Charlotte Islands. Much information from the project is posted on the Internet on the Ministry site (address: http://ei.gov.bc.ca/geology). The intent is to have geology, mineral potential estimates, MINFILE, mineral titles information and other data available on the Internet. Through the MapGuide viewer (downloadable from our site) posted data may be viewed and manipulated. The geology and some associated datasets may also be downloaded in Arc Export (EOO) format from the site.

The Branch received $135,000 from the Corporate Resource Inventory Initiative to maintain the Mineral Potential database of the Province and to prepare more detailed mineral potential maps of the Cassiar-Iskut-Stikine planning area.

An earthquake hazard map of the Greater Victoria area was completed in 1997 with funding from the Capital Regional District. The map will be released in 1998.

The Terrain Stability project, funded by Forest Renewal BC, was in full swing in 1997. The Branch audits digital terrain data submitted by forest companies in compliance with the new Forest Practices Code and makes this data available over the Internet. Also, existing paper maps are being digitized and added to the database. In 1997 over 600 maps were digitized.

Aggregate potential maps were prepared for the Okanagan Regional District at their request.

Publications

The Branch moved to print-on-demand and toward Internet publishing for maps and reports. Selected geoscience publications can be found at:

http://www.ei/gov.bc.ca/geology

Prospector Assistance

The Government continued to issue grants to encourage prospectors to conduct grassroots exploration in the Province. Forty seven prospectors received grants worth more than $400,000 in 1997.

The Alberta Geological Survey restructured itself into four Home Teams: Client Services, Mineral Resources, Energy Resources, and Program Support.

AGS effort is mainly focused on the Kakwa-Wapiti area in Western Alberta and on the Athabasca-Birch Mountains area in North East Alberta. The results will provide support for metallic and industrial minerals exploration and development, oil sands development, and land use planning.

Data were gathered on the bedrock geology of the Kakwa-Wapiti area, Quaternary and hydrogeology of NE Alberta, and coal bed methane. A preliminary classification of facies types of the Athabasca oil and sand deposit was developed. A much larger than expected amount of Quaternary geology data for NE Alberta was obtained from various sources and activity was shifted from field work to data entry.

Aggregate, and industrial and metallic minerals studies of the Kakwa-Wapiti area and NE Alberta continued, as did Quaternary studies in Kakwa-Wapiti. The growing effort in diamond exploration, together with the very encouraging results from the Buffalo Head - Wabasca region, have resulted in an unprecedented demand for AGS minerals-related products and expertise in Alberta. The diamond bulletin (AGS Bulletin No. 63), for example, is going into its second printing and the daily requests for information are up significantly.

Growth in information sales and Web site accesses exceeded expectations, and it was found that the Web site helps increase dissemination of hard copy products. The growth of the geographic area represented by those accessing the Web site was surprising: all continents are being covered. Also, a significant increase in accesses by the financial/investment sector was observed.

AGS is developing meta data standards for its information products in cooperation with the NGSC. It is also undertaking a review of its product strategy and product quality standards.

Funding for the Saskatchewan Geological Survey remained unchanged in 1997-98 at $2.5 million inclusive of professional and support staff salaries, summer student hiring and field, office, and laboratory operational expenditures. Projects were similar to those carried out in 1996-97 and were designed to meet priorities identified by the Geoscience Audit, completed in 1996. The participation of the Geological Survey of Canada in the major La Ronge - Lynn Lake Bridge Project was a significant initiative resulting from negotiations surrounding the development of a Bilateral Agreement to the National Geoscience Accord. Additional enhancements to the province's geoscience program were achieved through cooperative ventures with the mineral exploration industry and the Saskatchewan universities.

PRECAMBRIAN GEOLOGY

Three Saskatchewan Geological Survey and one Geological Survey of Canada mapping parties were active on the La Ronge - Lynn Lake Bridge Project. This major 5 year project, initiated last year, will see completion of 1:20 000 map coverage of the Palaeoproterozoic La Ronge Domain to the Saskatchewan - Manitoba border, will examine the relationships of major crustal units accreted to the Rae-Hearne Craton in a north-south transect on Reindeer Lake and evaluate mineral potential. Other regional mapping projects were ongoing in the Scimitar Complex, a high metamorphic grade extension of the Flin Flon greenstone belt, which is currently an area of high exploration activity, and in the Wollaston Domain. Wollaston projects focussed on developing a stratigraphic model for sediment hosted copper and lead-zinc and on elucidating regional stratigraphy and structure in a transect southeast of the Athabasca Basin. The latter project has potential implications for uranium exploration in the Basin and is a cooperative venture with the uranium industry and the University of Regina. The Survey has been increasingly successful in promoting and integrating into its field program undergraduate and postgraduate student research at the Saskatchewan universities.

INDUSTRIAL MINERALS

Investigations of pumicite (volcanic ash) deposits in southwestern Saskatchewan were initiated to determine if their is any potential for economic concentrations of zeolite group minerals. Field mapping of the Sahli Granite, located near Pelican Narrows, was undertaken to find possible quarry sites for this 'green granite' building stone. Diamond investigations included: sedimentological, geomorphological, and paleontological studies of the Middle Miocene, Wood Mountain Formation, which is known to contain anomalous numbers of diamond indicator minerals and sample processing and diamond indicator mineral picking of esker samples collected in partnership with Monopros Limited on the Precambrian Shield during 1996. Work continued on the Brine Database through systematic sampling and analysis of formational waters from petroleum wells. Brines could provide the feedstock for a diversified chemical industry in Saskatchewan.

Petroleum Geology

Three subsurface projects continued, one on Cretaceous post-Manville Group rocks, another on Lower Paleozoic strata, and the third on the production of annotated digital 1:20 000 000-scale structure and isopach maps of the province's main Phanerozoic stratigraphic units.

Oil exploration and development activity continue to grow with the numbers of both horizontal and vertical wells substantially higher than in 1996. However, the number of natural gas wells showed a slight decline. This level of activity is expected to continue into 1998, as Deep Rights Reversion comes into effect. A consequence is the high demand being placed on the Petroleum Geology Branch for core and sample examinations, for well information and for processing of industry submitted, drill cuttings, and well log data. To help overcome this problem, several amendments were made to the Oil and Gas Conservation Regulations. Core storage space has also been filled fast in recent years necessitating construction of a warehouse extension to the Subsurface Laboratory. This should be operational by year end.

COMPUTERIZATION

The survey, following the direction provided by the Geoscience Audit, continues to develop digital products and processing capability. All current Precambrian geology maps are produced using FieldLog and AutoCAD on digital bases provided by Sask Geomatics. Compilation digital 1:1 000 000 scale Quaternary and bedrock geology maps are

respectively, completed and awaiting publication, and preliminary and in critical review. Mineral claim, assessment work area and report index maps, together with geology maps, should soon be available as digital products as negotiations with Sask Geomatics on competitive pricing of the digital base for these products have been satisfactorily concluded.

The Internet site for the department,

www.gov.sk.ca/enermine

has been significantly expanded and upgraded and will continue to see addition of information items. Various GIS software products are being evaluated for survey and department use, using available digital data files.

MINERAL RESOURCE ASSESSMENTS

Pressures to implement Forestry Management Agreements and develop by the year 2000 Saskatchewan's Representative Areas Network have required mineral resource appraisals as part of an integrated land use planning process. Appraisals have been completed for the Pasquia-Porcupine and Suggi Lowland areas in east-central Saskatchewan, the Primrose Lake air weapons range in west-central Saskatchewan, and the Prince Albert area in central Saskatchewan. Current work is focussed on the Amisk-Atik planning area in the southeastern Shield, an area of high mineral exploration activity and potential. The mineral assessment methodology, developed by the Ontario Geological Survey, is qualitative and integrates existing geological and geophysical data with mineral deposit models.

NATIONAL GEOSCIENCE ACCORD

Saskatchewan has signed the National Geoscience Accord defining the relative roles of the Geological Survey of Canada and the Saskatchewan Geological Survey. Negotiations for a Bilateral Agreement are well advanced and signing is expected shortly. Planning sessions were held in January and March, 1997, respectively for the hardrock and softrock sections and opportunities for collaboration identified and in part implemented.

EXPLORATION AND DEVELOPMENT

Surface mineral exploration expenditures are estimated at $43 million in 1997, compared to actual expenditures of $35 million in 1996. Most of the increase results from grassroots uranium exploration activity which will rise from $17 million in 1996 to $24 million. In addition, expenditures for underground uranium exploration and development at the Cigar Lake, McArthur River and West Dominique Janine properties will be ten times this amount. Cameco has begun construction on the McArthur River uranium project following approvals by the two levels of government. McArthur River scheduled for production in 1999, is the richest and among the largest deposits in the world. It contains proven reserves of 72 600t u (189 million lb U_3O_8) at an average grade of 15.9% U (18.7% U_3O_8), additional resources of 87 600 tu (227.8 million lb U_3O_8), and there is high potential for expanding reserves. Construction at the McClean Lake uranium mine/mill is nearing completion and production is anticipated in the second half of 1998.

Exploration expenditures on gold remain low at around $5 million. The Komis Gold Mine of Waddy Lake Resources Inc. closed because of a lower than anticipated gold grade and production at the Contact Lake Gold Mine failed to meet expectations for a similar reason. The Contact Lake Mine will likely shut down in mid - 1998. The Seabee Mine of Claude Resources improved production performance in the first half of 1997 by 35%, completed a new shaft and hoist and reported an increase in reserves.

Base metal expenditures are expected to rise from $5 million in 1996 to $10 million, largely as a result of an extensive exploration program by Leader Mining International Inc. in the Scimitar Complex. The complex is believed to be a high metamorphic grade extension of the Flin Flon greenstone belt. Leader has recently reported open pit mineable resource of 79 million tons with a grade of 1% equivalent copper. Hudson Bay Mining and Smelting announced the decision to begin underground exploration at the Konuto Lake copper deposit near Flin Flon.

Diamond exploration expenditures are projected to decrease from $6 million in 1996 to $4 million, however, drilling and sampling of the For à la Corne and Candle Lake diamondiferous kimberlites continued.

High levels of oil and gas production and exploration persist, reflecting the application of horizontal drilling techniques which lead to higher production and lower cost in exploiting existing pools. Discoveries in Ordovician Red River strata continue to stimulate deep drilling programs in Saskatchewan. An additional impetus for deep exploration will be provided by new legislation - Deep Rights Reversion. Regulations - which will take

effect in 1998. Companies producing from upper level strata will be required to explore lower levels, or forfeit the mineral rights to the deeper strata to the government for potential resale.

During 1997, Geological Survey programming in Manitoba continued to build in momentum, along with other government initiatives directed at stimulating increased levels of exploration and investments in the province's mineral sector. The strategic plan of the Department of Energy and Mines, now in its third year, includes the introduction of more favourable taxation policies, an enhanced Mineral Exploration Assistance Program (MEAP), Prospector Assistance, one window permitting procedures and increased funding for geological surveys ($3.6 million in 1997) to generate new maps and information that will underpin the exploration efforts of the private sector.

In January, the Geological Services Branch (GSB) was reorganized into two new sections, a Precambrian Survey and a Sedimentary and Industrial Minerals Section (SIMS), each headed by new Chief Geologists. These field-oriented units will be supported by a Geoscience Information Services Unit (including a digital cartography component) and an Administrative Services Unit. SIMS also oversees the activities and functions of the Rock Preparation Laboratory at Midland Street. In April, 1997, management of the Branch's Analytical Laboratory on Logan Avenue was transferred to the Manitoba Technology Centre along with established commitments to continue servicing/supporting mineral explorationists in the province.

The programs of the GSB have been reviewed on several occasions over the last few years and feedback from industry and other client groups was used to frame a new five year plan. This formed the basis for discussions at a joint GSB/Geological Survey of Canada (GSC) Regional Needs Workshop convened January 16, 17th, 1997, in Winnipeg, the objective being to develop an expanded program including contributions from the GSC. The resulting document entitled Manitoba's Geoscience Needs was distributed in June to all members of the Mineral Exploration Liaison Committee, the National Prospector and Developers Association, all explorationists active in the province and northern communities whose well being depends on mineral development. It is intended that the plan be reviewed and amended annually to ensure that the work of the Branch remains relevant and is focused on areas of importance to industry.

Components of the new plan include Memoranda of Agreements with various companies where joint work is being undertaken, multi-agency, multi-disciplinary CAMIRO- (Canadian Mining Industry Research Organization) sponsored projects in the Thompson and Snow Lake regions, new GSC/GSB NATMAP (National Mapping Program) initiatives in the northern Superior Province and Southeast Manitoba, and a new hydrogeological project in the Williston basin involving the provincial Water Resources Branch, the GSC and the GSB. Existing commitments to conclude the Shield Margin (NATMAP) program in the Flin Flon/Snow Lake region and the Capital Region study around Winnipeg are integral to the aims of the plan. In addition, the GSB has subsequently become involved in discussions with the GSC and a wide array of provincial agencies, as well as potential contributors from the United States, to scope out new programs that would contribute toward a better understanding of the major flood event on the Red River that occurred in April/May of this year.

Flin Flon/Snow Lake

In the north, this years field program continued to balance work in established mining districts (Flin Flon/Snow Lake and Thompson) with new mapping and geochemical surveys in under-explored regions such as the northern Superior Province.

In May, the preliminary manuscript of the 1:100 000 geological compilation for the Shield Margin project was completed and displayed at the Geological Association of Canada Annual Meeting in Ottawa. Editing of this preliminary map continues with the goal of having a final compilation complete for public release in November, at the 1997 Manitoba Mining and Minerals Convention. Papers for inclusion in a Canadian Journal of Earth Sciences Special Volume dedicated to the Shield Margin Project, are in preparation and a Shield Margin NATMAP CD-ROM will be completed six months after releasing the final hard copy maps.

Detailed mapping of the Flin Flon mine "rhyolitic package" exposed on Millrock Hill provided new insights into the nature and location of this horizon. 1:20 000 mapping in the Naosap-Aimée-Alberts area defined a major NE-trending fault zone that represents a crustal scale structural break separating lithologically, stratigraphically and structurally distinct volcanic suites. At Snow Lake, a new 1:20 000 scale geological mapping program, initiated at Squall Lake to upgrade exist-

ing maps and to provide a more detailed geological and structural framework for gold exploration in this region, demonstrated that the pre-metamorphic Birch Lake Fault is an imbricate splay of the McLeod Road Thrust. New mapping at Herblet, Osborne and north of Snow Lake enhanced the stratigraphic and structural understanding of this region, as input to the new 1:50 000 compilation. The relationship between the geological structures and gold mineralization is the subject of a Masters Thesis at the University of Manitoba.

Detailed mapping of the host rocks to a number of gold deposits and occurrences in the vicinity of the New Brittania Mine showed that the mineralization occurs predominantly in altered mafic pyroclastic and intrusive rocks along early structures and predates the end of the latest metamorphism.

Rare earth element studies of rhyolites and sulphides from massive sulphide deposits in the Flin Flon-Snow Lake area indicate that light rare earths, Europium in particular, are depleted in alteration zones around VMS deposits, and are enriched in exhalite-tuff associated with the massive sulphide lenses. Data from the Spruce Point Deposit suggests that the Eu enrichment may be a useful tool in the exploration for VMS deposits.

Mineral Deposit Series Reports 63K/10 and 63N/3 will be released at the November Convention.

The Flin Flon Regional Office continues to be active, providing advice to the mineral exploration and mining communities in the region. As with other regional offices, the communications capabilities have been expanded with the establishment of an Internet e-mail account.

Lynn Lake

At Lynn Lake a pilot lithogeochemical/structural study of the Burnt Timber gold mine was carried out with the cooperation of Black Hawk Mining Incorporated. Field mapping and drill core investigations suggest a predominant structural control for the gold-pyrite-quartz mineralization.

Thompson Belt and Churchill Superior Boundary Zone

On June 1st, a major three year research initiative was launched to investigate the factors controlling nickel mineralization in the Thompson Belt. The project is co-sponsored by six companies (Cominco Ltd., Falconbridge Ltd., Hudson Bay Exploration and Development Company Ltd., Inco Ltd., Teck Corporation and WMC International Ltd.). NSERC support for an Industrial Research Chair Application (Laurentian University) has been confirmed, and approval of a collaborative research and development grant (University of Manitoba, l'Universite du Quebec a Montreal, University of Alberta, GSB, GSC) is under consideration. The methodology will involve integration of archival and newly generated geological, mineralogical, geochemical, geochronological and geophysical data using GIS technology. Several interrelated field investigations were completed during the 1997 season. Basaltic and komatiitic flows at Mystery, and Mid lakes and north of Setting Lake were sampled as were several mafic dikes. New 1:50 000 geological compilations will be completed for the entire area between Moak and Setting lakes by February 1998, under a MOU between INCO and the GSB. Subsequent work will extend this coverage south, to link up with previous compilations south of Ponton. Drillcore studies focused on the relatively undeformed ultramafic and mafic intrusive rocks from the sub-Paleozoic segment of the TNB, including samples from Cedar Lake, William Lake and the Minago River to Setting Lake region.

At Assean Lake, new mapping was undertaken as part of a cooperative program involving the University of Alberta, with joint funding provided through NSERC, GSB and the Swiss government. Geochronological sampling at Assean Lake, Paint Lake and Cross Lake, augmented by archived samples from Sipiwesk Lake, will provide new isotopic ages for much of the Churchill-Superior Boundary region.

On Setting Lake, rocks belonging to the Ospwagan Group were traced along the full 45 km of the lake. The Ospwagan Group, the newly identified Grass River Group terrestrial sediments, and the Archean basement gneisses and tonalite gneiss each occupy separate fault-bounded folds or panels, and each is intruded by a different set of Proterozoic dykes or sills.

Systematic mineralogical examination of Ospwagan Group supracrustal rocks was undertaken to expand the existing characterization of the lithostratigraphy and provide new constraints guiding exploration for nickel.

Northern Superior Province

One of the primary objectives of Manitoba's Northern Superior Project is to better understand the volcanic, structural and tectonic evolution of greenstone belts in this sector of the province. Central to this objective is an understanding of the

Oxford-Knee Lake Belt, the largest contiguous greenstone belt in the area. Accordingly, a team of geologists visited the region during the summer and undertook to remap the extensive shoreline exposures on southern and central Knee Lake, looking for key and distinct lithological associations and major structural breaks pointing toward unique structural and stratigraphic packages. This resulted in a better definition of the stratigraphy in rocks of the Hayes Group, identification of facies within a rhyolite complex and flanking volcaniclastic rocks, identification of stratiform alteration zones in Hayes Group basalts, and a lithological and structural reinterpretation of the Oxford Group. Associated geochronological sampling and dating will improve the understanding of the age relationships within and between the sundry stratigraphic panels.

Also under Operation Superior, the second phase of multi-media geochemical surveys was completed in the Red Sucker Lake region. Open Files containing preliminary results from Phase 1 (1996) were released in March and May, together with the results of the regional till sampling conducted jointly by the GSB/GSC. New 1:20 000 scale geological mapping was undertaken at Little Stull-Rorke and Kistigan lakes and reconnaissance mapping and geochemical/geochronological sampling was carried out in the Stull Lake area in cooperation with the GSC and Ontario Geological Survey (OGS). Two reports are under development, interpreting and compiling all geophysical data from assessment files relating to past exploration in the northern Superior Province. The first report and 21 accompanying maps (encompassing portions of NTS areas 53K, 53L, and 63I), will be released in November in conjunction with the Department's Annual Convention.

Thematic mapping and geochemical studies in the eastern part of the Carrot River Greenstone Belt characterized a 2 km thick section of Archean Oceanic crust. Locally intensive sea floor hydrothermal alteration and associated Fe-Cu-Zn sulphide mineralization is taken to indicate significant potential for as yet undiscovered VMS mineralization. In addition, a potential for gold mineralization exists along an east-northeast striking deformation zone containing abundant quartz-sulphide vein networks. Recent forest fires have resulted in new exposures of metre-thick spinifex-textured komatiite flows that provide an excellent opportunity to record textural sequences and document geochemical and petrographic characteristics.

A major new project to better understand the factors controlling gold mineralization in the northern Superior, this year focused on Henderson (High Rock) Island, Island Lake. At this location, detailed geological mapping highlighted the importance of late structures (at high angles to the dominant regional deformation zones), in localizing the gold mineralization.

A 1:250 000 digital geological compilation covering the core of the northern Superior (NTS areas 53L, 53M, 63I, 63P) has been compiled as a base for all other work. A new 1:250 000 compilation of bedrock geology in NTS area 63H (Norway House) was also completed.

The M.Sc. Thesis documenting the mineralogy and genesis of Fe-Ti-V oxide mineralization in the Pipestone Lake Anorthositic Complex (PLAC) has been completed. The thesis confirmed a magmatic origin for the oxides and indicates that the PLAC was derived from four separate influxes of chemically similar magma. The research is ongoing and will better characterize the petrogenetic and metallogenic significance of widespread anorthositic magmatism throughout the Pikwitonei Domain and the Cross Lake-Kiskitto Lake region during the late Archean.

SE Manitoba

In the Rice Lake belt a NATMAP field tour familiarized participants active in the Western Superior NATMAP and Northwestern Superior LITHOPROBE projects with the geology of the region. Examination of the geology and PGE tenor of the gabbroic upper portion of the Bird River Sill was undertaken in collaboration with Gossan Resources Ltd. Sampling and detailed mapping was carried out on the Chrome property.

Central Manitoba

In central Manitoba, mapping, stratigraphic drilling and geochemical sampling of Devonian high calcium limestone units, and salt springs near Mafeking continued to evaluate the potential for Prairie-Type micro-disseminated gold mineralization in cooperation with Birch Mountain Resources. Elsewhere along the Mesozoic escarpment, numerous samples were taken as part of a regional study evaluating the potential for significant occurrences of black shale and bentonite. To the east, in the Grand Rapids and Gypsumville regions, numerous new fresh water artesian springs and tufa mounds were confirmed in the Central Interlake where geochemical investigations of the groundwater are evaluating the potential for Mississippi-Valley-Type mineralization in the Silurian and Ordovician sequences. Bedrock fracture measurements were taken on outcrops and in numerous quarries

throughout the Interlake to better define the structural controls that may have influenced paleokarst development and subsequent deposition of silica, kaolin and other types of mineralization. At Arborg, three holes were drilled in an attempt to better define the extent of buried channels containing Cretaceous kaolin.

Southern Manitoba

Further south, work in the Capital Region focused on compiling a database south of latitude 50N. Documentation of surficial deposits was extended through 1:100 000 scale mapping, in NTS areas 52L, 62H and 62I, together with clay sampling on a 10K grid to help define flood-related deposits and new dyke construction material. Discussions between the provincial Water Resources Branch, the GSC, GSB and other parties concerned with groundwater resources, have led to the implementation of a new multi-year hydrogeological study focused on the Winnipeg region, but also extending to define the subsurface architecture of the broader Williston Basin margin in Manitoba.

A manuscript identifying the regional geologic and geomorphic controls that impact on the physical environment of Lake Winnipeg is nearing completion, with publication as part of a GSC Open File scheduled for the Fall.

Three holes (two to basement) were drilled to better define the regional geological setting of the Precambrian basement in the Selkirk area, where new exploration interests are currently active looking for nickel and platinum group metals. Two of the holes intersected ultramafic rocks and iron formation similar to those known in the Bird River greenstone belt to the east. Compilation of a 1:250 000 bedrock geology map for NTS area 62I (Selkirk) is advanced, with the intention of releasing this map in November.

In Winnipeg, the Geoscience Information Services Section continued to make progress in phasing in a wide array of new GIS capabilities, and enlarging the Branch's presence on the Website. The 1:1 000 000 scale Wetlands Map, produced in cooperation with the University of Alberta and LINNET corporation was completed in ArcInfo, and numerous new customized colour geological maps have been developed using the Branch's new plotter. In preparation for a new 1:1 000 000 scale Quaternary map of the province, a digital compilation of Quaternary and aggregate index maps for the province has been initiated, a provincial basemap imported into MAPINFO, and test plots of scanned and vectorized map data are currently being evaluated.

The Branch continued to provide geological input to land use issues including aboriginal land claims, selection of candidate areas for the Endangered Spaces Campaign, and proposals for creation of new potentially restrictive land-use designations such as ecological reserves, rezoning of provincial parks *etc.* The Branch is also represented on the MEAP panel evaluating the technical attributes of private sector exploration proposals seeking financial assistance. In May, the Branch hosted an Enzyme-leach Workshop for industry explorationists in Winnipeg, and a Prospector training Workshop in Thompson. Numerous field tours and demonstrations were given throughout the summer, to Aur Resources, TVX and Claude Resources in the Flin Flon and Snow Lake areas, for Birch Mountain at Mafeking, Falconbridge, REA and the GSC in the Bissett district, and with the GSC and OGS in the northern Superior region and at Thompson.

Displays highlighting various aspects of Manitoba's geological potential were generated for several major conferences, such as the PDAC (Toronto), Mines Ministers (St. Johns Newfoundland), GAC/MAC (Ottawa), and Calgary Mining Forum (Calgary).

INTRODUCTION

Geoscience activities in Ontario are delivered by business units within the Mines and Minerals Division, Ministry of Northern Development and Mines. The mission of the Division is to: a) focus on the provision of geological information, gathered and interpreted in support of the minerals industry; b) administer the Ontario's Mining Act in a fair and consistent fashion; and c) eliminate barriers to growth in the mining sector, reduce regulatory burden on the industry and work with industry to stimulate job reaction. Only the geoscience activities are described in this report.

Metallic mineral exploration activity in Ontario focused primarily on base metals, gold, diamonds, and rare metals. Expenditures for general and mine site exploration in 1997 are forecast at $189.6 million (21.6% of Canadian total) compared to preliminary expenditures of $177.9 million (20.4%) in 1996 and $129.7 million (18.1%) in 1995. Total expenditures for both mineral exploration and mine site development are forecast to be $383 million in 1997, up 5.5% from the 1996 figure of $464 million. Ontario accounted for 32.6% of the value of Canada's non-fuel production in 1996. The value of Ontario's production declined just over 3% as did Canada's. Much of the decline in value is attributed to the drop in the price of copper. The output of nickel and gold showed substantial increases. A decline in annual nickel and copper production figures is expected this year because of strikes at the Sudbury-based operations of Inco Limited and Falconbridge Limited.

Operational budgets in the division continue to experience in-year adjustments as part of the Ontario Government's agenda to reduce the size of government and achieve savings while maintaining key client services. In 1997-98, re-organization principally affected the Resident Geologist and the Mining Lands programs (see below).

ECONOMIC ACTIVITY

Advanced Exploration

Several advanced exploration projects are ongoing, including:

1. Victoria Creek shaft sinking project at Sudbury Contact Mines Limited (Abitibi Subprovince).

2. OK Zone at the Detour Lake Gold Mine (Abitibi Subprovince).

3. Goldcorp Inc's Red Lake gold mine (Uchi Subprovince) is the subject of an intense two-year exploration program.

4. Madsen Gold Mine of Madsen Gold Corp. (Uchi Subprovince).

5. Victor deposit of Inco Limited (Sudbury Igneous Complex).

6. Cargill phosphate deposit of Agruim Inc. is subject of a development decision (Kapuskasing Structural Zone).

7. Havic Lake granite quarry of Cold Spring Granite (northwestern Ontario).

8. Trap rock quarry held by L. Alaire & Sons (Sudbury area).

9. Montcalm base metal project of Outokumpu Mines Ltd. (Abitibi Subprovince).

Two advanced exploration projects in the Abitibi greenstone belt (Royal Oak's Matachewan and Echo Bay's Aquarius projects) have been put on hold pending improvement in the price of gold.

New or Expanded Operation

New mines, mine development and expansion projects include:

1. Placer Dome, 32% interest held by JVX gold Inc., opened the Musselwhite mine, located 500 km north of Thunder Bay on April 1, 1997.

2. Battle Mountain and partner Teddy Bear Valley Mines spent approximately $55 million to put their Holloway gold mine into production.

3. Lockerby Mine of Falconbridge Limited (Sudbury Igneous Complex).

4. McCreedy East project of Inco Limited (Sudbury Igneous Complex).

5. Depth Development Program" at Campbell Gold Mine of Placer Dome Canada (Red Lake greenstone belt, Uchi Subprovince).

6. Pic Lake Zone at Winston Lake Mine of Inmet Mining Corp. (Wawa Subprovince).

7. Edwards Deposit, under agreement with Ven-Can Gold Corporation, of River Gold Mines (Wawa Subprovince).

8. Falconbridge Limited is spending about $35M to modernize and upgrade its Falconbridge complex.

9. Canmine Resources Corporation continues to develop and investigate new cobalt resources (Winnipeg River - English River subprovinces).

ORGANIZATIONAL RESPONSIBILITIES

The geoscience function focuses on the collection, analysis, maintenance, and dissemination of objective earth science information on the geology and mineral endowment of Ontario for the effective management of Ontario's mineral resources, and to enhance the province's economic performance and environmental well-being. The geoscience functions are delivered through the following programs:

A - Resident Geologist Program

B - Geoscience Program;

C - Information Management Program.

The units of the Mines and Minerals Division that are involved in the delivery and support of the geoscience functions are:

- Precambrian Geoscience Section (PGS)
- Sedimentary Geoscience Section (SGS)
- Resident Geologist Program (RGP)
- Geoscience Laboratories
- Information Services Section (Publication Services Section)
- Data Services Section (DSS)
- Mining Lands Section
- Mines Group

The Precambrian Geoscience Section, Sedimentary Geoscience Section, and Resident Geologist Program comprise the mapping and client services component of the Ontario Geological Survey. Information Services and Data Services sections are the means by which the OGS data and knowledge are produced, archived and disseminated to clients. The Geoscience Laboratory is responsible for the geochemical analysis of the OGS sample materials. The Mining Lands Section is responsible for supporting the legislation governing assessment information. Industrial mineral and building stone expertise and projects are the responsibility of the Mines Group.

GEOSCIENCE ACTIVITIES - HIGHLIGHTS

Economic Development

A prime objective of the geoscience program is to support and stimulate the minerals industry to foster economic development in Ontario. Evidence of this contribution is the recorded number of active claim units that reached 183 299 at the end of 1996, the highest level attained in over 100 years. Claims in good standing have increased in 1997. Much of the exploration activity is taking place in additional mining camps, such as Red Lake, Timmins and Kirkland Lake. OGS products and services were key in the discovery and subsequent exploration of a rare metal pegmatite field in northwestern Ontario. The initiation of recent diamond exploration in the Wawa and Kapuskasing areas is attributed in large part to OGS geoscience projects. OGS projects and staff knowledge have been tapped by the private sector over the past 25 years as part of the ongoing exploration and economic appraisal of a carbonatite-hosted phosphate resource, presently being considered for development. Investigations by OGS staff in the Wabigoon Subprovince contributed to the current exploration of gold mineralization in the Marmion batholith.

Precambrian Geoscience Section (PGS)

Field work during the 1997 summer consisted of: one provincial-scale geophysical project jointly delivered with Data Services Section; two mineral deposit investigations (rare metal pegmatites and kimberlites in Ontario); three regional compilations; and seven regional mapping projects. Mapping of northwestern Ontario and northeastern Manitoba is taking place under the auspices of NATMAP. Ontario's mapping share is jointly delivered by the Geological Survey of Canada (GSC) and OGS. Three base OGS maping projects in the Abitibi greenstone belt are complemented by one pri-

vate sector-GSC-OGS partnership and two university-private-sector-OGS partnerships. Regonal bedrock mapping in the Hemlo greenstone belt complements detailed investigations sponsored by Canadian Mining Industry Research Organization. The western part of the Superior Province craton is under investigation by LITHOPROBE-sponsored research.

PGS and RGP geoscientists discovered a new and exciting rare-metal pegmatite field in northwestern Ontario and, in collaboration with geoscientists from the Sedimentary Geoscience Section, have stimulated diamond exploration in the Wawa and Kapuskasing areas. Regional and detailed mapping in the Abitibi Subprovince, the Wabigoon Subprovince, Sachigo Subprovince and the Uchi Subprovince continue to stimulate exploration activity.

Sedimentary Geoscience Section (SGS)

Field work in 1997 consisted of: two aggregate inventories; two Quaternary mapping - surficial materials sampling projects; two methods development projects; and two regional geochemists surveys. The release of two lake sediment and water geochemistry reports (Montreal River-Temagami and Schreiber areas) spurred staking and exploration activity because they reported on potential mineralization that had not previously been explored in detail.

Previously conducted PGS bedrock and SGS Quaternary mapping and surficial sampling in the Wawa area, continued to generate kimberlite/diamond exploration successes. Millions of dollars of exploration activity has resulted in the discovery of several kimberlite pipes, some of which contain diamonds.

SGS geochemists and Quaternary geologists continued their applied research on the development of mineral exploration methods in areas of thick overburden. Work focused on the use of selected leaches and groundwater as indicators of buried mineralization. Portions of this work were done in co-operative partnership with the Geological Survey of Canada.

Resident Geologist Program (RGP)

The Resident Geologist and Mining Recorder programs underwent rationalization in 1997. Regional offices were closed in London and Cobalt. Seven Resident Geologist positions and 11 Administrative Assistants were eliminated across the province. The new Resident Geologist Program structure revolves around the estalishment of "service delivery teams" under the direction and supervision of management based in Timmins, Thunder Bay and Sudbury. Six Regional Resident Geologists are responsible for service delivery and providing technical leadership and guidance to their respective districts as well as to subordinate district offices under their charge. An Industry Liaison Geologist located in Toronto will help disseminate information to the Toronto and southern Ontario clients, assist in attracting mineral exploration investment to Ontario, and develop partnerships between the division and the private sector. A Community Resource Geologist in Thunder Bay will help transfer geological knowledge and exploration skills to northern communities, especially First Nation communities, and assist in building and fostering linkages between these communities and the minerals industry. The RGP integrates client service delivery with the Mining Lands programs. Staff from both programs work closely together in the regional offices to provide support services as required.

Information Services Section (ISS)

Marketing Activities

Responsibility to market the geoscience, tax and infrastructure benefits of Ontario falls under the auspices of the Information Services Section. Marketing includes participation in national and international industry trade shows. The ISS also has the responsibility for the library and publication functions. The publication functions are carried out by the Publication Services Section.

Publication Services Section (PSS)

In the 1997 calendar year, 67 geoscience publications, 11 digital data sets and 1 full-colour popular publication were released. A cut in PSS staff contributed to a further delay in a planned move to release all publications on digital media, preferably CD-ROM. PSS is also devoting a staff member to the loading of digital publications into the Ministry's digital Earth Resource land Information System (ERLIS). Completion of this task will permit the reprinting of publications which are currently out of print. Having the complete publications in ERLIS will also permit a move toward on-demand printing of all current and historical reports and maps.

Data Services Section (DSS)

As part of a concerted communication's initiative, divisional web pages were published on the Ministry's Internet Web site. Information is pro-

vided on programs and activities of the Ontario Geological Survey, including the regional offices, the Mining Lands and Mines regulation programs, the publications and digital data products and exploration opportunities. Since its launch in February 1997, the site has become a major source of information for our clients and its contents are being updated on a regular basis. The Ministry's home page is:

http://www.gov.on.ca/MNDM/

Partly to facilitate organizational restructuring, the access to and distribution of data and information via the Internet has become a strategic initiative. Towards this objective, two major initiatives are underway to provide mining claims summary reports and claim maps via the Internet.

The popularity and effectiveness of computer assisted methods for search and analysis of mineral exploration data is on the increase. Consequently, client access of the Ministry's digital Earth Resource Land Information System (ERLIS) and ongoing maintenance of digital data by Ministry staff for assessment files, mineral deposit occurrences, drill hole summaries, lithogeochemical analyses and reprocessed aeromagnetic-electromagnetic surveys continued at a steady pace. Additionally, we also use our data repository as the source for packaging an increasing number of data products that can be purchased on digital media through publication sales.

Geoscience Laboratories

During 1997, several alternatives for this function are being investigated that would include the Geoscience Laboratory in a research park, located on the campus of Laurentian University. A decision is anticipated before the end of the 1997-98 fiscal year.

The co-operative program initiated last year between Laurentian University and the Laboratories continues. Students in departments including Geology, Biology and Chemistry are currently working on research projects using data obtained from the Laboratories' instruments. Collaborations also exist with academic and research organizations outside the Ontario government.

Budget

The 1996-97 base budget for the geoscience activities of the Mines and Minerals Division (see budget table) was approximately $11.1 million (M). External to base budget was approximately $2.3M from the Canada-Ontario Northern Ontario Development Agreement and $2.0M for the Ontario Prospectors Assistance Program (OPAP). The 1997-98 base budget for geoscience activities is approximately $11.8M, comparable to the 1996-97 allocations. The apparent increase in the budget allocation for 1997-98 is a distortion attributed largely to an in-year adjustment related to salary benefits. Assistance for prospectors (OPAP), in the amount of $2M external to base budget, was made available in fiscal 1997-98. The Canada-Ontario Northern Ontario Development Agreement terminated at the end of fiscal year 1996-97.

JOINT PLANNING WITH THE GEOLOGICAL SURVEY OF CANADA

In the spirit of the National Geoscience Accord, signed at the 1996 Mines Ministers' Conference in Yellowknife, the OGS is working with the GSC to ensure that the geoscience needs of Ontario are defined and addressed. Joint delivery of geoscience investigations in northwestern Ontario, under the auspices of NATMAP is one example of this collaboration. A Bilateral Geoscience Agreement is under development Fruitful, joint consultation and planning for future geophysical, bedrock and other geoscience investigations continues.

ONTARIO GEOLOGICAL SURVEY ADVISORY BOARD

In November, 1997, the OGS will convene the inaugural meeting of the OGS Advisory Board. The Advisory Board will provide client-focused, expert advice and guidance to the Minister of Northern Development and Mines on major program priorities of the OGSS, to guide the OGS in meeting its core business of providing the province's geological data and mapping function. The Advisory Board will: a) comment on the annual Business Plans; b) review reports of technical advisory committees concerning the activities and products of the OGS; c) comment on Alternative Delivery Mechanisms to help deliver the OTGS mapping program; d) advise on co-operative programs involving the OGS with private sector, universities and the GSC; e) advise on the direction and or emphasis of the OGS programs and suggest reallocation of program resources where warranted; g) advise on the general geographic areas that should be the focus of OGS mapping activities; h) advise on suitable approaches to address geoscience problems; and i) advise on appropriate information management issues, including the production archiving, and distribution of information products.

LA DIRECTION DE LA GÉOLOGIE (DG)

Le ministère des Ressources naturelles (MRN) appuie le développement économique durable des régions du Québec en favorisant la connaissance, la mise en valeur et l'utilisation optimale du territoire québécois et de ses ressources énergétiques, forestières et minérales.

Dans ce contexte, la Direction de la géologie est l'unité administrative du MRN responsable de l'acquisition, du traitement et de la diffusion des connaissances géoscientifiques nécessaires à l'établissement et à la promotion du potentiel minéral du Québec, informations indispensables au bon fonctionnement de l'exploration minérale au Québec.

La mission de la Direction de la géologie est d'acquérir, de traiter et de diffuser des connaissances géoscientifiques sur les ressources minérales du Québec dans le but d'évaluer et de promouvoir le potentiel minéral des régions dans une perspective de développement durable.

Sur une base annuelle, le personnel de la Direction réalise plus de 50 projets allant du levé géologique de territoires nouveaux à la production de cartes d'évaluation du potentiel minéral, en passant par diverses compilations (ex. : données sur les forages). Toutes ces informations sont rendues disponibles à la clientèle de l'exploration minérale sous forme numérique ou sous format papier.

La Direction de la géologie compte, en 1997-1998, 130 employés répartis au bureau central situé à Charlesbourg et dans sept bureaux régionaux (Montréal, Sherbrooke, Sainte-Anne-des-Monts, Sept-Îles, Rouyn-Noranda, Val-d'Or et Chibougamau).

LE SERVICE À LA CLIENTÈLE DE L'EXPLORATION (SCE)

Le Service à la clientèle de l'exploration regroupe l'ensemble des services au comptoir offerts dans huit (8) régions du Québec soit, Montréal, Sept-Îles, Sainte-Anne-des-Monts, Sherbrooke, Rouyn-Noranda, Chibougamau, Val-d'Or et Québec. À l'exception du bureau de Québec, les bureaux régionaux sont sous la responsabilité d'un géologue résident.

Chaque bureau offre les services suivants :

- la communication de renseignements généraux sur l'industrie minière;
- la communication de renseignements sur les programmes d'aide financière;
- la communication de renseignements sur la Loi sur les mines;
- la consultation et la reproduction de la documentation géoscientifique;
- la vente de documents géoscientifiques;
- l'assistance technique aux utilisateurs du SIGEOM;
- la conservation et l'archivage de la documentation géoscientifique;
- le repérage de la documentation géoscientifique;
- la vente et la mise à jour des cartes de titres miniers;
- le traitement partiel des dossiers relatifs aux titres miniers : l'analyse de recevabilité, la création de dossier, l'accusé de réception et la saisie préliminaire.

LE SERVICE DE LA GÉOINFORMATION (SG)

En 1996-1997, le SG a révisé et préparé pour publication 90 nouveaux documents géoscientifiques faisant état des résultats de travaux géologiques, géochimiques et géophysiques. Parmi ceux-ci, on compte 20 nouvelles cartes géologiques géoréférencées résultant des travaux de terrain de l'été 1996 et disponibles en formats papier et numérique.

Le SG a poursuivi la compilation et la numérisation des produits de compilation géoscientifique dans le Système d'information géominière du Québec (SIGÉOM). Des équipes oeuvrant sur un quart de travail de soir ont permis d'accélérer le rythme de numérisation et d'optimiser le rendement des postes de numérisation. Les derniers contrats de numérisation des données des forages au diamant se sont poursuivis. De plus, les données de plusieurs cartes de forages au diamant déjà compilées depuis 1992 ont été rendues « intelligentes »,

ce qui représente une plus-value considérable pour effectuer des recherches et des tris.

Le guide de numérisation des gîtes minéraux a été rédigé et celui de numérisation des cartes de compilation géologique de la province a été mis à jour. Ceci permettra d'accélérer la production de ces cartes au cours de la prochaine année.

Les objectifs de production pour 1997-1998 sont :

- rendre disponible en format numérique la localisation des périmètres des travaux d'exploration pour 30 % des cartes de la province;
- localiser et décrire dans le SIGÉOM les indices minéralisés de 50 % des cartes de la province;
- compléter la localisation, la description et la numérisation de toutes les données des forages au diamant de la province;
- numériser 60 cartes de compilation géologiques à l'échelle 1:50 000;
- développer et tester un nouveau module dans le SIGÉOM en vue d'y intégrer les blocs erratiques et numériser 60 % des blocs erratiques signalés dans le fonds documentaire de la province;
- mettre sur Internet le Bulletin REPÈRES signalant périodiquement à notre clientèle les nouveaux documents géoscientifiques et les nouveaux rapports privés d'exploration qui sont disponibles;
- réaliser une étude de faisabilité visant à mettre sur Internet la base de données EXAMINE sur les références du fonds documentaire sur les ressources minérales (quelque 60 000 références).

LE SERVICE GÉOLOGIQUE DE QUÉBEC (SGQ)

Le Service géologique de Québec dessert un vaste territoire qui comprend les Appalaches, les Basses-Terres du Saint-Laurent, la majeure partie du Grenville et l'ensemble du territoire du Nouveau-Québec situé au nord du 55^{e} parallèle. Une équipe constituée d'une vingtaine de géologues réalise les levés et les études géologiques. Les géologues sont localisés principalement à Charlesbourg où se trouve le secrétariat du SGQ et aussi dans les bureaux régionaux de Montréal, de Sept-Îles et de Sainte-Anne-des-Monts.

En 1997-1998, le SGQ dispose d'un budget de 3,3 M$ pour réaliser 19 projets. Encore une fois cette année, l'accent est mis sur la cartographie géologique. Ainsi, la plus grande partie des ressources sera consacrée à la réalisation de 11 projets qui généreront 23 nouvelles cartes géologiques : 4 feuillets au 1:20 000, 17 feuillets au 1:50 000 et 2 feuillets au 1:250 000.

Au niveau des faits saillants, mentionnons la poursuite des travaux de cartographie entrepris dans les régions d'Ashuanipi, de Wakeham et de Manitou sur la Côte-Nord. Ces travaux sont réalisés dans le cadre du Programme du Moyen-Nord qui vise à attirer l'attention des compagnies d'exploration sur un vaste secteur peu connu où il est possible de trouver des gisements de classe mondiale. Rappelons que la découverte de l'indice de nickel et de cuivre du lac Volant faite l'an dernier par un géologue du SGQ continue d'avoir des retombées importantes dans cette région (39 intervenants, 11 000 claims). Ajoutons que d'autres levés géologiques ont été réalisés au cours de l'été dans la province géologique de Grenville (dans les régions de l'Outaouais, du Lac-Saint-Jean et de Mont-Laurier) et dans les Appalaches.

LE SERVICE GÉOLOGIQUE DU NORD-OUEST (SGNO)

Le Service géologique du Nord-Ouest dessert l'Abitibi, le secteur de la Baie James et une partie du Grand-Nord québécois. Son effectif est réparti dans trois bureaux régionaux (Rouyn, Val-d'Or et Chibougamau). Le personnel de direction est regroupé au bureau de Val-d'Or. En 1997-1998, le SGNO dispose d'un budget de 2,14 M$ pour réaliser 15 projets, dont 11 sont des travaux de cartographie ou des études thématiques.

La poursuite du programme d'exploration du Moyen-Nord a permis de réaliser trois projets de cartographie d'envergure (le projet Laguiche, le projet Yasinski et le projet Eastmain). Deux autres projets d'inventaire complètent la cartographie géologique (le projet Ouagama et Ligneris). Plusieurs études thématiques impliquant des travaux de métallogénie, de géochimie et de volcanologie sont en cours de réalisation, en collaboration avec plusieurs universités et centres de recherche (des travaux métallogéniques dans le secteur du lac Yasinski et des mines Gonzague-Langlois et Louvicourt; la géologie de la région de Val-d'Or et les gisements d'affiliation; la géochronologie du Nord-Ouest et du Moyen-Nord).

L'implantation du Système d'information géominière du Québec (SIGÉOM) se poursuit avec la réalisation de plusieurs cartes de compilation géologique, particulièrement dans le secteur de Chibougamau. De plus, toutes les cartes géolo-

giques réalisées au cours de l'été sont maintenant intégrées au SIGÉOM; ces cartes seront disponibles en format numérique à la fin de novembre 1997.

En ce qui concerne l'évaluation du potentiel minéral, l'intégration au SIGÉOM d'un nouveau module dédié à la description systématique des fiches de gites a permis la numérisation des fiches réparties dans 224 feuillets topographiques (1:50 000). Ce projet de numérisation de l'information gitologique se poursuit.

LE SERVICE DES MINÉRAUX INDUSTRIELS ET DE L'ASSISTANCE À L'EXPLORATION (SMIAE)

Le SMIAE regroupe le personnel oeuvrant dans les champs d'activité suivants : les minéraux industriels, la géochimie, la géophysique et les programmes d'assistance financière à l'exploration minière.

Groupe des minéraux industriels

Le groupe des minéraux industriels et des matériaux de construction a réalisé différentes études sur les substances suivantes : les ardoises du Québec, les carrières au SaguenayLac-Saint-Jean, la tourbe dans le Bas-Saint-Laurent, les ressources en granulats dans la région de Rouyn-Noranda, les sources de calcaire comme pierre de taille. Le groupe a aussi travaillé à l'organisation du 33e Forum sur la géologie des minéraux industriels en collaboration avec SOQUEM et l'ICM.

Groupe de la géochimie

Au coût de 3 M$, en partenariat avec cinq sociétés d'exploration minière, le MRN a réalisé un levé géochimique des sédiments de lac; ce levé couvre une superficie de près de 350 000 km^2, ce qui en fait un des plus importants levés du genre au monde. Un total de 26 191 échantillons de sédiments de lac ont été prélevés à la densité d'un échantillon par 13 km^2.

Groupe de la géophysique

La majorité des études géophysiques sont incorporées aux levés géologiques. Un levé électromagnétique héliporté d'une superficie de 4000 km^2 (22 I 11, 12, 13, 14) sera complété au cours de l'année 1997-1998. Les données préliminaires de ce projet, effectué à contrat au coût de 750 M$, sont actuellement disponibles.

La Division des programmes d'aide

La Division des programmes d'aide a pour mandat de concevoir et d'administrer les programmes d'assistance financière à la prospection et à l'exploration minière :

* Le Programme d'assistance à l'exploration minière du Québec

Ce Programme dispose de crédits de 9 M$ sur trois ans pour soutenir l'exploration de base au Québec. L'assistance financière maximale pour les prospecteurs est de 4000 $ pour un projet de prospection de base et 15 000 $ pour un projet de prospection avancée; pour les compagnies, elle peut atteindre 50 % du coût des travaux (maximum de 50 000 $ par projet) et les Fonds régionaux d'exploration peuvent toucher 200 000 $ par Fonds. À la fin du mois de septembre 1997, les montants engagés pour les prospecteurs (200 projets) et les fonds régionaux (ceux du Bas-Saint-Laurent, de la Gaspésie et du SaguenayLac-Saint-Jean) totalisent 1,5 M$; les sommes allouées aux compagnies s'élèvent à 1,5 M$ pour 34 projets.

* Le Programme d'exploration minière du Moyen-Nord

Ce programme s'adresse uniquement aux compagnies et connaît un vif succès depuis son entrée en vigueur à la fin de 1994. Plus de 5 demandes ont été reçues dans le cadre du Programme du Moyen-Nord pour l'année 1997-1998. À la fin de septembre 1997, le MRN a accepté 30 projets, pour des engagements financiers de 2,6 M$.

* Les Fonds d'exploration autochtones

Lors du dernier Discours sur le budget, le gouvernement du Québec a annoncé l'octroi d'un budget de 3 M$ sur 3 ans (1 M$/an) pour faciliter le développement de l'entreprenariat minier autochtone dans les régions du Moyen et du Grand-Nord. L'approche préconisée sur le territoire consiste à favoriser la mise en place de Fonds d'exploration minière autochtones. Une première entente spécifique a été signée avec les Inuits sur le territoire du Nunavik, en septembre 1997.

INTRODUCTION

The Geological Surveys Branch (NBGSB) is the main agency delivering geoscience programs in New Brunswick. Branch activities have been delivered through two regional offices, Bathurst and Sussex, and the Head Office in Fredericton. After the Program Review in 1995, the Geological Surveys Branch was recently reorganized to include the activities of the Mineral Information Services and Industrial Minerals sections. The Branch consists of Geological Surveys (North), Geological Surveys (South) and Mineral Deposits and has a staff of 34 with a total budget of $3,161,000 from all sources.

GEOSCIENCE PROGRAMS

EXTECH II (Northern N.B.): The five-year (1994-1999) EXTECH II program in the Bathurst Mining Camp, has a joint federal/provincial funding of $6.8 million and is in the final year devoted to field work. The program is being coordinated by Wayne Goodfellow of Geological Survey of Canada (GSC) and Steve McCutcheon of NBGSB. In 1997-1998, thirteen GSC staff and 8 NBGSB staff collected the geoscience information with operating funds of $220,000 each from GSC and NBGSB.

Bedrock mapping concentrated on problem areas (NTS 21 O/9, 21 P/5, P/12) and also detailed mapping around Wedge, Nepisiguit, Taylor Brook and Stratmat deposits. Mineral deposit studies were carried out on the Heath Steele belt, Restigouche, Taylor Brook, Nepisiguit, Wedge, Caribou, Brunswick #12 and Stratmat. Surficial geology mapping was done on NTS 21 O/9 and O/10 at 1:50 000 scale and detailed mapping was carried out around selected mineral deposits. Detailed stream sediment and water geochemistry work was carried out around the Murray Brook and Restigouche deposits. Geophysical characterization on various lithotypes and on sulphides was also carried out in selected areas.

All the data related to the multi-parameter geophysical survey on the entire Bathurst Mining Camp was released to the public both in digital and hard copy format. The survey was flown at a line spacing of 200 m, with a mean clearance of 60 m and was managed by both the NBGSB and GSC. The survey consisted of magnetics, electromagnetics and radiometrics. Funds for the project was provided by the Canada-New Brunswick Cooperation Agreement on Economic Diversification.

Restigouche Project (Northwestern N.B.): Phase I of the Restigouche project began in 1997-98 with a total provincial funding of $540,000. The project consists of three phases (Phase I, II and III). Phase I involves an airborne geophysical survey with similar specifications as in the Bathurst Mining Camp, and a stream-sediment geochemical survey over a test block near Campbellton. The geophysical surveys consists of flying 10,630 line kilometres at a line spacing of 200 m. Geochemical surveys involves the collection of 750 stream-sediment samples, 50 + element analyses and an orientation survey. To date, the field component of both surveys was completed according to GSC specifications. Both NBGSB and GSC staff are currently managing the project. The second phase will consist of an evaluation of Phase I results, including follow-up geological mapping by staff of the Minerals and Energy Division and will be carried out in 1998-1999.

If the results are positive, Phase III consisting of geological, geophysical and geochemical surveys for the entire Restigouche belt will be carried out in 1999-2002.

NATMAP (Southern N.B.): The three-year New Brunswick component of the NATMAP program on Magdalen Basin was formally completed by March 31, 1997. In the summer of 1997, bedrock mapping was carried out on NTS 21 H/12, H/13 and 21 G/9. A final report is in preparation.

Southern New Brunswick: Bedrock mapping was carried out to refine the interpretation in problem areas. Several mineral occurrences are being investigated in the field. Work is in progress on the St. Stephen nickel deposit.

The report pertaining to the geology and development potential of Precambrian limestone and dolomite deposits in New Brunswick is in the final stage of completion. Aggregate resource maps for the greater Fredericton area will soon be released to the public. Aggregate resource maps for the Moncton area are in preparation.

Surficial geology mapping was carried out on NTS 21 J/3W and 21 H/14. Reports on Surficial Geology of NTS 21 H/12 and J/3W are under preparation.

The GIS section provided support for mapping, mineral deposit studies, geophysical surveys and for the management of mineral claims. As part of the Integrated Mineral Resource Management System (IMRMS), Geoscience Publication Indexing System (GPIS), Mapping Module (Monalisa), a Mineral Claims Management System has been developed using CARIS (graphics) and INGRES (Relational database).

An active Internet Website has been developed and contains Industry Highlights, Mining and Development, Exploration, Publications and Information, Industry News, Contacts, Calendar and Annual Review of Activities. The website location is:

http://www.gov.nb.ca/dnre/minerals

EXPLORATION

Exploration expenditures for 1996 are $16.1 million and are expected to be the same for 1997. In 1996, there was a 27% increase over exploration activity in 1995; this increase was attributed to the Bathurst airborne geophysical survey. Base metals and gold are the focus of exploration in northern New Brunswick. The emphasis of exploration in southern New Brunswick continued to be platinum, palladium, gold, titanium, tin, potash, limestone and renewed interest in nickel. An active oil and gas exploration program is also being carried out in southern New Brunswick.

In 1996, Noranda made a new discovery in the Bathurst Mining Camp as a direct result of the airborne geophysical survey. Although the discovery is a long way from a mine, this new base metal prospect, which is south of Caribou and north of Indian Lake, is a significant find in this area.

MINING AND DEVELOPMENT

Mining is continued at Brunswick No.12, Heath Steele, Potacan and PCS mines. In addition, several quarries of limestone and aggregate and peat operations are also continuing at full production.

The Caribou mine operated by Breakwater Resources Inc. resumed production in June 1997 after having been shut down since 1990. As ore production resumed at the underground Caribou mine, the Restigouche open pit, 30 km from the Caribou site, was also being brought to the production stage. The company is confident that present and indicated reserves will be sufficient to ensure a ten-year mine life at the Caribou mine and five years at the Restigouche pit.

At present both mines are delivering ore to the Caribou mill, at a combined rate approaching the target rate of 3,000 t/d. Marketable lead and zinc concentrates are being produced and shipments of concentrate are expected to begin within weeks. The company reports that it is making progress in moving toward target recoveries.

Together, the two operations employ a workforce of 280, including contractors doing the mining at the Restigouche site.

EXPLORATION AND DEVELOPMENT ASSISTANCE PROGRAMS

Mineral Exploration Stimulation Program (MESP): In order to provide stimulus to the exploration industry, the Province of New Brunswick continued its support of the prospector incentive program, called the Mineral Exploration Stimulation Program (MESP), by approving 39 grants totaling $50,000 in 1997. The grants helped a number of prospectors to option their properties to exploration companies who rely on the prospectors to find areas of interest.

New Brunswick Exploration Assistance Program (NBEAP): NBEAP is a federal/ provincial assistance program aimed at assisting the Junior sector in New Brunswick. The program was initiated in 1994 with an annual budget of $400,000, and later expanded to three years (1994-1997) with a total budget of $1.2 million. The program provides assistance of 50 percent of project costs to a maximum of $40,000 per company. To date $1.2 million was awarded to 58 (properties) out of 91 proposals. As a result of $1.2 million investment through NBEAP, more than $6.7 million has been expended by junior mining companies.

Value-Added/Mineral Processing (VAMP): One of the major issues of the Provincial Mineral Policy released in 1993 was the desire to add value to mineral production in New Brunswick. In 1996, the Province introduced a new program aimed at value-added products. The program is entitled Value-Added/Mineral Processing (VAMP). The program provides direct assistance for projects that could lead to increased metal/mineral recoveries, as well as value-added products. Reasonable expenditures directly attributable to the projects, except for the acquisition of capital equipment, are considered eligible under VAMP. A total of $100,000 was allocated for this program in 1996. This program benefits the New Brunswick mineral industry with

an added incentive to seek out value-added opportunities.

ANNUAL REVIEW OF ACTIVITIES

The 22nd Annual Review of Activities of the New Brunswick Minerals and Energy Division will be held at the Sheraton Inn, Fredericton, Wednesday, November 12, 1997 to Friday, November 14, 1997. The program includes an Industrial Minerals Seminar, Technical Sessions, Poster Sessions, Core Shack and an Industry Trade Show.

The Mineral and Energy Resources Division is the geoscientific arm of the Department of Natural Resources. It is responsible for providing a comprehensive, integrated geoscience knowledge base for the province in support of mineral exploration and development, integrated resource management, sustainable economic development in non mineral sectors, environmental protection, land-use planning and scientific research.

Divisional programs are delivered through three sections, Geological Mapping and Geochemistry, Mineral Resource Evaluation, and Geoscience Information Services.

GEOLOGICAL MAPPING AND GEOCHEMISTRY SECTION

Mapping of the Central Meguma Project area continued in NTS 11D/13 and 11E/04 and adjacent areas. Significant advances have been made in documentation of the Meguma Group, the Musquodoboit Batholith, and the adjacent Carboniferous strata in the Kennetcook and Shubenacadie basins. Geological maps (Fieldlog/digital data) and the Meguma Enhanced Aeromagnetic maps and digital data will be released as open file maps in 1997.

The Hants-Colchester Lowlands surficial geology project in the Shubenacadie and Musquodoboit area continued. This work established the presence of extensive deposits of Cretaceous clay and silica sand in the Musquodoboit and Shubenacadie valleys which has directly stimulated extensive private sector mineral exploration activity.

MINERAL RESOURCE EVALUATION SECTION

Work of the Mineral Resource Evaluation Section includes work related to the Mineral Inventory, Coal Basins, Base and Precious Metals, and Industrial Minerals.

During the 1996-97 fiscal year, staff of the Mineral Inventory Program continued working toward providing a user-friendly, menu-driven computer database of information on the province's mineral occurrences. The department publicly released Version 1 of the FoxPro® for Windows database (.dbf format) and the Run-Time View® Program to access the data in the fall of 1996. At present, there are approximately 2200 mineral occurrences in the database.

Geoscience projects in most of the major coal-bearing basins in the province involved geological mapping activities targeted at areas that have significant mineral and energy resource potential and resource evaluation activities including: (1) geological studies within active coal mines focusing on features that may prove a hindrance to underground and open-pit mining; (2) research and documentation of energy resources including lignite, coal, coal bed methane and petroleum; and (3) a new project to evaluate potential community based economic development of world class fossil sites.

A summary of work on the Gays River and Walton projects was written up for a special issue of Economic Geology in collaboration with Geological Survey of Canada geologists with a total of seven papers co-authored by departmental staff. A report on the investigations into the timing and nature of the Cu-Pb-Zn-Ag mineralization at Dunbrak as written.

Work on pegmatites and their relationship to mineralization at East Kemptville was presented at the Geological Association of Canada annual meeting and work on a paper continues. Graduate study, partially supported by a contract, has produced a report and a thesis on the nature of the greisens in the East Kemptville area.

A major new project was begun in 1997 in Cape Breton Island, focusing on the base and precious metal metallogeny of the pre-Carboniferous crystalline terranes. Field work is initially concentrated in the late Proterozoic volcanic belts of southeastern Cape Breton which host volcanogenic massive sulphide deposits.

Gold Deposits

Activities within the Precious Metals Project were directed at (1) the re-evaluation of temporal relationships and associated isotopic studies of veining and metamorphism at the Cochrane Hill and Moose River gold deposits, (2) a research project at Saint Mary's University to evaluate the bulk gold potential and geochemical characteristics through the 'axis zone' at Upper Seal Harbour, and (3) client services. Field work, isotopic and REE investigations at Cochrane Hill revealed the presence of two distinct vein morphologies, sulphide-

poor and sulphide-rich, with slightly different temporal relationships. The relatively younger sulphide-rich, auriferous veins and the older veins have both suffered effects of amphibolite grade regional metamorphism at 390-400 Ma. These studies may significantly alter our understanding of the mineralizing processes in the Meguma strata.

A five year project to document and compile information on the gold deposits of Nova Scotia's eastern Shore in Guysborough and Halifax Counties began in 1997. Future investigations of gold occurrences as well as metallogenic and geological compilations will be carried out under the auspices of this project.

Various members of the Mineral Resource Evaluation Section have been involved in providing background information to the mapping staff in their continued research into the potential for the development of economic kaolin deposits in Nova Scotia.

The aggregate program for 1996-97 focused primarily on the Annapolis Valley Project in the third year of a three year field study, initiated to evaluate and document the aggregate potential in the region. The field season, from July to October, consisted of an examination of the aggregate resources in parts of Annapolis and Digby counties. It included the valley floor, the North Mountain and part of the South Mountain. All aspects of the resource were evaluated, including glacial sand and gravel deposits, till, bedrock potential and an examination of all pits and quarries. A sampling program was conducted to determine the quality of some of the better materials. At the end of the project resource maps and a report will be provided for the entire region.

While conducting the aggregate studies discussed above, the opportunity was taken to examine bedrock for dimension stone potential. Several promising sites in the South Mountain Batholith were identified and a diamond-drilling program was carried out.

GEOSCIENCE INFORMATION SERVICES SECTION

This section is accountable for the management and delivery of geoscience information and publication services and products, educational programs and prospecting courses, mineral land-use planning, drill core and sample storage facilities and services, and monitoring of mineral exploration activities in Nova Scotia.

The Digital Data Services Group has been developing a Geographic Information System for use by Minerals and Energy Branch staff and their clients. A Public Access GIS has been developed and is now available for client use in the library. This is a user friendly system created in ArcView® which has the ability to display, query and plot maps of geological, geochemical, geophysical and land-use information for any area of the province.

An internet website is being developed for the branch. It can be accessed at:

http://www.gov.ns.ca/natr/meb

NOVASCAN is the provincial bibliographic database that provides access to publicly available geoscience documents concerning the Nova Scotia land mass and offshore regions. As of March 31, 1997, the database contained 13 789 Nova Scotia Department of Natural Resources records, consisting of 6017 assessment reports, 3164 publications, 1197 journal literature references, 1227 open file maps, 1170 open file reports, 72 open file illustrations, 756 theses, 142 contribution series, 7 internal documents, 34 books, and 3 outside publications.

Preparation of a digital, thematic atlas on mineral resource land-use information began this year. This includes a set of interactive, digital maps covering the province at 1:50 000, based on a compilation of mineral-based inventories. A reference map of Nova Scotia's mining heritage was compiled showing the locations of all major past and current producing mines. Development continued on a GIS-based 1:500 000 scale map titled *Land Designation and Ownership Map of Nova Scotia*, which provides users with an improved understanding of the location, distribution and ownership of special land-use designations. A secondary or derived map *Access to Mineral Resources in Nova Scotia* provides a simple classification of designated lands according to access limitations for mineral-based interests.

Helping various audiences understand and appreciate the importance of minerals and mining is the key objective of the Minerals Outreach Program. During the 1996-97 fiscal year this objective was met by preparing and delivering a variety of programs such as prospecting courses, teachers' workshops, class presentations, articles and newsletters, and public interpretive walks. During the fall of 1996, 34 people enrolled in the Basic Prospecting Course. Print material for students and teachers, visitors, residents, and other audiences is a rich source of information about the minerals, geology and the mineral industry in Nova Scotia. Several print projects are underway and will help

readers learn more about various mineral commodities and the geological history of the province. Two teachers' workshops, one at the University College of Cape Breton and the EdGeo Workshop at Acadia University, helped teachers acquire knowledge and teaching strategies for minerals, mining and geology. Finally, bringing the experience of minerals and mining to elementary school students and their teachers was successfully achieved by having nine classes visit the department's annual Review of Activities in November 1996.

The Drill Core Library in Stellarton, Pictou County, and its satellite storage locations in Debert, Colchester County, and Paradise, Annapolis County, house an extensive collection of drill core and other geological samples. These materials, which in addition to drill core, include well cuttings, rock slabs, geochemical samples, till samples and a variety of other types of samples, are obtained from exploration programs and other geological investigations conducted by the mining and petroleum industries as well as by other organizations, including this department. The core and samples, which are freely donated to the department, are catalogued and maintained for the use of government, educational, and industry researchers, who may re-examine, re-analyze or conduct new projects with the available samples. Reference documentation (logs, reports, maps) may also be consulted. These facilities provide an excellent resource, having an estimated value exceeding $40 million, for those working towards the development of Nova Scotia's mineral industry and the increased knowledge of the province's geology and natural environment.

A total of 5 400 m of additional drill core were received from 72 holes in 1996-97, bringing the cumulative fiscal-year-end total to 639 677 m. Client use totalled 278 user-days, a 15% increase over the previous year.

INTRODUCTION

The Geological Survey of Newfoundland and Labrador's (GSNL) program for 1997-1998 comprised some 30 projects having a total budget of $3.2-million. The budget was funded entirely from provincial appropriation and represents the first year of a three-year budgeting process following Program Review in 1996-1997.

Program Review was a comprehensive cross-government process under which every activity of the public service was subjected to three tests: Public Interest, Efficiency and Affordability. At the end of the process, eight positions had been eliminated in the Survey – five geologists, two chemists (Geochemical Laboratory) and one cartographer (retirement) – for a total salary reduction of approximately $350 000. Despite these lost positions, the core elements of the Survey's program remain. However, to address the under funding extant in field operations, some $200 000 was reprofiled from general-operating funds (rental savings) to support field projects. The impact of Program Review on the Survey was almost entirely borne in the first year (1997-1998) of the three-year process. Stable funding at current levels is projected for the next two years.

The Survey also took the opportunity of Program Review to revise its management/ operations structure. The former Labrador Mapping and Newfoundland Mapping sections were combined into a new Regional Geology Section, thereby eliminating one management-geologist position. Also, the Project Management Section (field logistics, financial control) was taken out of the Survey to provide similar support to the whole Mines Branch, including the Geological Survey (*see* Organization Chart).

Exploration activity remained high in the province for 1997. Labrador continues to lead with $58-million in expenditures projected, of which approximately $25-million represents expenditures by INCO on its Voisey's Bay property. On the Island, total expenditures are projected at $14.5-million, which along with last year (at $15-million) is the highest they have been since 1990. Approximately 5 000 claims were staked in Labrador and 10 000 in Newfoundland during 1997; these are part of the 120 000 total claims in good standing at the end of the year.

PROGRAM HIGHLIGHTS

Bedrock Geology Surveys

The northern part of the Nain Plutonic Suite (NPS) in Labrador was the subject of continued 1:50 000-scale mapping by Bruce Ryan. Rocks previously included in the Mesoproterozoic NPS have been separated and defined as Paleoproterozoic by Ryan, and they have been subsequently dated by the GSC's Michael Hamilton and confirmed as Paleoproterozoic. The older mafic rocks also contain magmatic-sulphide mineralization, indicating that it is not just the younger NPS rocks that are exploration targets in Labrador.

Part of the Mealy Mountains terrane of the eastern Grenville Province, Labrador, was mapped at 1:100 000 scale by Charles Gower. The poorly exposed Upper Eagle River area contains Late Paleoproterozoic orthogneiss and metasedimentary gneiss, which are intruded by granitoids of various ages. The granitoids cut a pronounced northeast-trending and plunging regional antiform that is accentuated by an aeromagnetic pattern.

The Ordovician Wild Bight Group of north-central Newfoundland was mapped at 1:50 000 scale by Brian O'Brien, and represents the western continuation of last year's mapping in the group. More mafic volcanic units were defined for the dominantly sedimentary, back-arc-basin environment of the western Wild Bight Group. The structural style consists of a dome-and-basin pattern caused by the refolding of thrust sheets and nappes.

Systematic 1:50 000-scale mapping of the Neoproterozoic Harbour Main Group and Holyrood plutonic suite, Newfoundland Avalon Zone, was carried out by Sean O'Brien. Cyril O'Driscoll assisted in the part of the study that is examining the hydrothermal alteration systems in the volcanic and granitic rocks. Benoît Dubé of the GSC is an important collaborator in the project. The focus is on the advanced argillic epithermal alteration, for precious-metal deposition similar to Hope Brook-style gold mineralization. So far, a volcanic-hydrothermal system has been identified with both proximal and distal environments of deposition, as well as the deeper seated porphyry environment.

Surficial Geology Surveys

Surficial-geology mapping at 1:50 000 scale and aggregate-assessment studies were carried out by Jerry Ricketts in the area west of Goose Bay, Labrador. Fluted tills and striations in the plateau areas indicate ice flow to the southeast. Outwash deposits in the main river valleys, *e.g.*, Churchill River, developed during glacial retreat. Deposits suitable for aggregate use were identified in large glaciofluvial outwash deposits containing eskers up to 20 km long. These and similar deposits will find use during construction of the Trans-Labrador Highway.

Till sampling for geochemical analysis and 1:50 000-scale surficial-geology mapping were the focus of a study by Martin Batterson and Dave Taylor in the Grand Falls – Gander area. Three directions of ice flow were determined: an early one to the east, a second major one to the northeast, and a late one to the east. During ice retreat, the main valleys were the conduits of meltwater drainage and received fluvial deposition. Understanding the difference in depositional history between the reworked tills in river valleys and primary till deposits at higher elevations is critical for successful exploration in surficial deposits.

Geophysical Surveys

The Survey's geophysicist, Gerry Kilfoil, continues to archive airborne geophysical data submitted by exploration companies as part of their assessment reports to government. Provincial regulations now require that these data be submitted in digital format, upon which they form an important contribution to the province's overall geoscience database. Once archived, and after the confidentiality period has expired, the data can be accessed as colour-shaded-relief images by using data-viewer software. Eventually an index to the various geophysical-survey blocks will be available and searchable by NTS area, license number, company name, *etc.* on the Survey's Home Page.

Mineral Investigations

Metallogenic studies of Ni-sulphide occurrences in northern Labrador continued with Andy Kerr. His work was in close cooperation with several junior companies in the area, and involved the logging and sampling of drill core from the various properties. Two styles of mineralization have been identified: epigenetic cross-cutting mineralization in anorthosites, and syngenetic disseminated mineralization in later mafic dikes and veins. The close spatial association between the two suggests that the epigenetic mineralization may be genetically linked to the suite of younger mafic intrusives.

A new project was initiated by Dave Evans to document, catalogue and interpret the gold occurrences of the Baie Verte Peninsula. This will provide a detailed account of the geological setting and style of mineralization of these occurrences. Most of the gold showings are in the Baie Verte Belt east of the Baie Verte – Brompton Line, and the majority of these are in the ophiolitic rocks and their Ordovician cover sequences. Gold occurrences are being classified as quartz-vein-hosted or altered-wall-rock-hosted mineralization.

Mineral Deposit Inventory

The Survey's Mineral Deposit Data System (MODS) is an ongoing project that provides information on the known mineral occurrences in the province. MODS consists of a manual Mineral Inventory File, published Mineral Occurrence Maps, and a computerized Mineral Inventory Database (MODS/PC). Parts of the Mineral Inventory Database are available on CD-ROM as part of other geoscience data sets, and therefore can be viewed using GIS in an integrated geoscientific context. During the past year, the MODS project continued its focus on documenting new mineral discoveries of nickel, copper and cobalt in Labrador.

Geographic Information Systems

The Survey continues to develop its GIS as the means of storage, access, retrieval and analysis of all elements of its geoscientific database. Various atlases of geoscientific data, including bedrock geology, surficial geology, geophysics, geochemistry and mineral occurrences, are available for certain regions of the province. Currently a project is being coordinated by Peter Davenport that involves several GSNL and GSC staff in the development of a digital geoscience compilation of the Nain area, Labrador. Once this project is complete, it will allow the production of customized maps at any scale and combination of data. The recently released (October, 1997) new geological map of Labrador, at 1:1 000 000 scale, is also available in digital format.

Open House 1997

The Mines Branch 21st Annual Review of Activities took place on November 6, 1997. This year it was held in conjunction with the CIM District 1 meeting in St. John's. The 'Open House' included reviews of GSNL and GSC activities, mining and exploration activities, and earth-science research at Memorial University. Technical pres-

entations consisted of talks on the evolution and metallogeny of Ordovician volcanic rocks of the Canadian Appalachians, the new Labrador geology map, nickel mineralization in Labrador, and the gold potential of the Appalachian Avalon Zone. Some 35 poster displays were also presented by GSNL and GSC geoscientists.

INTRODUCTION

The Northwest Territories' geoscience programs are jointly delivered by the Geology Division of the Department of Indian Affairs and Northern Development (DIAND) and the Minerals, Oil & Gas Division of the Department of Resources, Wildlife and Economic Development (RWED), Government of the Northwest Territories. The two agencies currently employ 15 professional geological staff and have a combined O&M budget of about $1.72M for the 1997-98 fiscal year. DIAND and RWED recently amalgamated their bedrock mapping resources into a single office which is jointly managed by the two organizations.

Mineral exploration continued to play a major role in the north's economy in 1997. Exploration expenditures for 1997 are forecast to be about $178.8M. While the number of exploration projects dropped between 1996 and 1997, the proportion of advanced projects increased, reflected by a significant increase in the amount of exploration drilling.

DIAND and RWED Responsibilities

DIAND and RWED play complementary roles in geoscience activities in the NWT. DIAND, under the Northwest Territories Act, administers the exploration and development of mineral resources on Crown lands in the NWT through the Canada Mining Regulations. The Department maintains a technical library and Archives of geological reports, maps and assessment records on mineral properties; collects and disseminates geoscience data; and provides advice and guidance to prospectors, exploration companies, government organizations, aboriginal groups and the general public on the geology and mineral deposits of the NWT. The Minerals, Oil & Gas Division of RWED delivers geoscience programs for the GNWT, through geological mapping, prospector support and educational programs such as Project Rocks. They support and encourage mineral development, while being commited to community-based economic growth. RWED strives to balance the interests of resource companies, communities and northern interest groups.

NWT Geology Division, DIAND Activities

The Geology Division hired four new indeterminate and three term staff in 1997. New staff include three new District Geologists, two mineral showings database staff, an Archives Geologist and a new Chief Geologist. In addition, an offer was recently made to fill a fourth vacant District Geologist position. Staffing is expected to be complete by January, 1998. The Division took advantage of the turnover in staff to make some changes in the areas of responsibility for the District Geologists, and to shift the focus of some of the positions.

As a result of the recent boom in exploration activity in the NWT, the last few years have seen a sharp increase in the number of assessment reports submitted to the Department for review, resulting in a significant backlog. District Geologists succeeded in completing evaluations of backlogged assessment reports, and the Division held meetings with industry clients to consult on concerns regarding the Canada Mining Regulations. Field studies by District Geologists include a study of granitoid-hosted gold in the eastern Cordillera, and a collaborative study of the regional metallogeny of the western Churchill Province with the Geological Survey of Canada. In addition, regional compilations of geological and mineral deposit data are underway for parts of the Bear, Cordillera and Churchill Provinces.

In 1997, Geology Division staff carried out bedrock mapping in the Bell Lake area of the southern Slave Province, focussing on stratigraphic and structural relations in the map area. In addition, twelve geoscience studies were carried out by university and other researchers. Seven of these projects were continuing, multiyear projects that were originally awarded in 1996. They include 1:50,000 scale bedrock mapping in the Angikuni Lake area of the western Churchill Province; geological compilations of the Slave Province and the Yellowknife greenstone belt; structural studies of selected granitoid bodies, and P-T studies of metaturbidites along the SNORCLE Lithoprobe transect; sedimentological studies of clastic deposits in the Slave Province; and a geochemical study on the evolution of selected greenstone assemblages in the southern Slave Province. The remaining five projects are new contracts, and they include a petrogenetic study of the Cretaceous Tungsten suite granitoids in the Cordillera; geochronological and petrological studies of basement xenoliths from a diatreme near Coates Lake in the Mackenzie Mountains; a study of the mineralogy and gem potential of pegmatites associated with the O'Grady Batholith (Cordillera); bedrock mapping along the southern margin of an

Archean metamorphic core complex in the south-central Slave Province; and radiogenic isotope studies in the western Churchill Province.

The Geology Division took on two major information management projects this year. NT MINFILE, a computerized mineral showings database project, was taken over from RWED in 1996 following completion of the Canada-NWT Economic Development Agreement. The application, renamed NORMIN.DB, was rewritten in Oracle, and the data are now compatible with other DIAND NWT Regional datasets such as land claim status, mineral claims, and environmental data. The system allows spatial and attribute queries, and is available to clients through a Web Browser. The second project undertaken by the Division was the conversion of paper and digital geological maps in Autocad into ArcInfo. This conversion is being done through an agreement with the Geological Survey of Canada, and will allow the integration of geological data with NORMIN.DB.

Minerals, Oil & Gas Division, RWED Activities

RWED currently employs two project geologists, two mineral assessment geologists and one support staff. In 1997, regional bedrock mapping projects were carried out in the Coates Lake area of the Mackenzie Mountains, and the Yathkyed Lake area of the western Churchill Province. The latter was funded by RWED, but run jointly with DIAND staff. The mineral assessment geologists are delivering a new program, called Mineral Development Areas (MDA), which was created to facilitate mineral exploration and development in areas with high mineral potential. The MDA's involve compilation of existing geological, geophysical, mineral showings, vegetation, wildlife and other data in a GIS format, followed by economic analysis in the context of such factors as regulatory regime(s) and infrastructure. The selection criteria for Mineral Development Areas include variables such as mineral potential, existing geological data, support from aboriginal organizations, land claims status, and infrastructure (existing or proposed). Two MDA studies are currently underway: the Coronation Gulf area of Kitikmeot; and the North Baffin Island/Melville Peninsula area.

Joint Activities

Since the Geoscience Needs Workshop held in conjunction with the 1996 Geoscience Forum, DIAND, RWED and the GSC have been working on a Trilateral Memorandum of Understanding (MOU) to integrate the delivery of the three agancies' respective geoscience programs and improve collaboration between the organizations. A draft MOU has been prepared, and it is hoped that it will be ready for signing by Ministers at the Geoscience Forum in late November.

In May, DIAND and RWED merged their bedrock mapping staff and resources into a single office, named the C.S. Lord Northern Geoscience Centre. The centre is located in DIAND's Core Library building, and provides a single location for the production of GIS-compatible digital colour geological maps by RWED and DIAND staff. The centre houses lapidary and petrographic facilities, sample storage, and will deliver RWED's Geoscience Education and Prospector Assistance programs.

Other collaborative projects in which DIAND and RWED are participants include the western Churchill NATMAP Program, and data compilation for the North Baffin Island/Melville Peninsula MDA.

Mining and Exploration Activities

Six gold and two base metal mines operated in the NWT in 1997. The gold mines are all located in the Slave Geological Province: Con, Giant, Lupin, Colomac, Ptarmigan and Mon Mines. The latter two are small, seasonal operations. As a result of low gold prices this year, Colomac and Ptarmigan Mines were closed. Nanisivik and Polaris Mines are carbonate-hosted lead-zinc producers located on the Arctic Platform in the high Arctic. Two new mines are expected to come on stream in 1998. BHP's Ekati Diamond Mine near Lac de Gras is currently under construction, and production is expected to begin in 1998. In the fall of 1997, North American Tungsten purchased the Cantung Mine in the western NWT, and announced that they hope to resume production within a year.

In 1997, exploration expenditures in the NWT accounted for about 20% of the total for Canada (~$178.8M). The Slave Province saw the bulk of exploration, primarily for diamonds and gold. One of the province's gold deposits, Echo Bay's Ulu deposit, fell victim to the low price of gold. Echo Bay suspended development early in the fall, although they are continuing feasibility studies. In the Churchill Province, exploration targets include gold, base metals and uranium. Exploration activity has been increasing steadily over the past several years in the Churchill Province, and some of these projects are now in advanced stages. Several projects in the Bear Province focussed on polymetallic Cu-Co-Bi-Zn-Ag-Au (Olympic Dam-type?) showings. Other areas that saw activity include Victoria and southern Baffin Island.

Geoscience Forum 1997

The 25th annual Geoscience Forum will be held in Yellowknife November 26 to 28. The forum features oral and poster presentations by government, university and industry on current research and exploration projects. Drill core and commercial booths are also on display, and several events are planned, including the annual Chamber of Mines banquet, the Charles Camsell Lecture, mine tours, and hospitality by local businesses. This year, the local chapter of the CIMM has organized a two day short course entitled "Mineral Economics of Exploration in the NWT", to be held the two days before the Forum. The Geoscience Forum is jointly organized by the NWT Chamber of Mines and DIAND Geology Division.

Government geoscience in Yukon took a big step this year; the federal and territorial geoscience staff and programs became operationally integrated. Until this time, each operated independently from separate offices. Thus DIAND, which inherited the geoscientific role in Yukon from the GSC in 1969, monitored and reported on mineral exploration in Yukon and studied mineral deposits and districts in support of industry. The Yukon Geoscience Office started in 1990 with detailed geological mapping in areas of exploration interest as a spur to exploration, under the aegis of the second Canada-Yukon Economic Development Agreement (EDA). This led, during the last five or six years, to two units with distinct functions.

This year the leaders of the two groups, Trevor Bremner and Rod Hill, realized that this represented an opportunity and took the initiative to begin integration. They instituted joint budgeting and cooperative and complementary operational planning for the year's work. The goal was a relevant program balanced between mineral deposit studies, detailed mapping, environmental geoscience and placer deposit studies and tightly connected with the work needed to meet requirements under DIAND legislation.

The integrated group operates under the banner "Yukon Geology Program." For now, although separate offices and distinct operational systems are a constraint; complete integration is a future target.

Weekly joint meetings of the combined staffs have followed on the program integration. This has given a clear sense of direction, engendered understanding of the interrelationship of the functions, and fostered cooperation and trust at the working level; it has begun to forge a cohesive unit. Operational lines are blurring and functions, seen as distinct until now, are integrating. Economies of scale are being realized through joint use of expertise, facilities and services.

The Yukon Geology Program lost its spark plug, Trevor Bremner, late in the year. At least for some months he will act as director of Mineral Resources for DIAND. Dirk Tempelman-Kluit has agreed to fill in for him in the short term.

As part of the jointly developed plan a Minerals Geologist, Julie Hunt, was hired to study Yukon volcanogenic mineral deposits. Several important new occurrences of this deposit type (Kudz Ze Kayah, Wolverine, Ice and Fyre Lake) made it imperative to begin this work on these occurrences about which little was known. In response to the huge exploration interest in the Finlayson Lake area Don Murphy began mapping the bedrock geology near the Kudz Ze Kayah Deposit.

Mineral deposit studies in the Dawson Range, one of the economically promising parts of Yukon, are the focus for Craig Hart.

Placer deposits and placer exploration are important elements of the Yukon economy. Much remains to be understood about the nature, origin and distribution of Yukon placers and the placer industry needs support with scientific ideas and data. The departure of the Placer Geologist from the EDA in 1996 left a vacuum. Bill Lebarge took the lead here and in cooperation with Frances Hein and Jeff Bond of the University of Calgary he focuses his work in the Mayo placer district. Two contractors, S. Morison and C. Mougeot, were hired to continue the Stewart River placer mapping project.

Sound environmental geoscience information for the Yukon is critical for balances, land use decisions including the land claims process, environmental reviews of development projects and new Parks. Karen Pelletier was hired as Environmental Geologist. This is a new position focused on the development of Mining Land Use regulations. She joins Hugh Copland and Diane Emond, two other Environmental Geologists who represent the minerals side of negotiations in the native land claims process and in mining environmental reviews. Daniele Heon, the Yukon Geology Program's link to planning for and decisions about Yukon Parks, worked on proposals along the Dempster Highway.

The departure of Steve Johnston and Derek Thorkelson from the Yukon Geoscience Office has reduced bedrock mapping strength. It also leaves the final report of Johnston's work in the Aishihik Lake area incomplete. Although Thorkelson retains a connection with the program, it will delay his final report on the Wernecke Mountains, which mapped in detail.

Much effort this year has focused on preparing final reports. Grant Abbott, Craig Hart, Don Murphy and Charlie Roots are close to completing

final reports on their work in the Hart River, Whitehorse, McQuesten and Mayo areas respectively.

Mike Burke, our main link to the exploration industry, continued to monitor Yukon hard rock mining and mineral exploration activity, to visit active properties and to review reports for assessment credit. Mike also maintains the assessment report library.

Part of the push to integration was to raise awareness of the Yukon Geology Program outside and inside government. Posters explaining the aims, results and impact of the bedrock, placer, and environmental geoscience work were prepared and presented for public view in the spacious foyers of the two government buildings in Whitehorse.

One early product of the new Yukon Geology Program is the Yukon-Minfile CD-ROM. This is a digitally searchable text file of known Yukon mineral occurrences, with thorough descriptions of the geology, mineralization and work history. Rob DeKlerk plans to add the digital database and map data to this product.

The Yukon Geology Program also supports work by several GSC scientists. Steve Gordey was supported to prepare a synthesis and compilation of Yukon Geology. It is planned for release in 1998 as a digital graphics file, from which the latest geological mapping down to 1:50 000 scale can be viewed and manipulated. It will provide the starting point for future Yukon bedrock mapping. A coloured paper map at 1:1 000 000 scale is planned as part of this effort. Rob Shives carried out an airborne radiometric and geophysical survey in the southern Ogilvie Mountains to test the effectiveness of the technique of bulk tonnage gold exploration. R. Friske reanalysed geochemical samples for the same region, for pathfinder elements to Fort Knox, bulk tonnage gold mineralization. A. Duk-Rodkin was supported to study the placer potential, high level terraces and glacial limits near Dawson.

Although EDA funding ended in 1996, the geology program was deemed so valuable and successful that DIAND and the government of the Yukon decided to continue it at a 50-50 cost share until 1998. The Yukon Geology Program's future depends on devolution of DIAND's Mineral Resources Directorate to the government of Yukon. Linkage of the people and integration of the work at the grass roots level is a key step of goodwill for success in that direction.

WORKSHOP REPORT
Canada's Geoscience Knowledge Base: Maintaining Our Competitive Advantage

54th Mines and Energy Minister's Conference
St. John's, NF, July 7, 1997

INTRODUCTION

A workshop entitled *Canada's Geoscience Knowledge Base: Maintaining Our Competitive Advantage* was held at the 54th Mines and Energy Ministers Conference in St. John's, July 7, 1997. Sponsored by the National Geological Surveys Committee (i.e., CPG and the GSC) and the PDAC, the workshop was designed to draw attention to the importance of Canada's geoscience knowledge base, particularly to the mining industry, to investigate ways of maintaining and enhancing the knowledge base, particularly by government geological surveys, and to raise an awareness of the serious erosion of funding for government surveys over the last ten years, particularly for the benefit of ministers and senior bureaucrats. Workshop participants were drawn from the usual cross-section of stakeholders that attend the Mines Ministers Conference, *i.e.*, mineral-industry organizations, mining companies and senior government officials. The Universities' perspective on and contribution to the knowledge base were also included in the workshop by a CCCESD-sponsored presentation and invited faculty participation, mostly from Memorial University. The workshop was chaired by Mary-Claire Ward of the PDAC, and she also gave an excellent summary (also the basis for this report) of workshop results to ministers at their open meeting the next day.

SETTING THE SCENE

To expand on the theme of the workshop and to set the scene for breakout deliberations, six ten-minute presentations were made to participants. The presentations were made by representatives of the PDAC, NRCan, NGSC, CCCESD and the BC-YK Chamber of Mines. The main points made can be summarized as follows:

- Canada is losing its proportionate share of exploration budgets.
- Reserves of some base metals are in decline in Canada.
- The geoscience knowledge base is essential to maintaining Canada's advantage. However, government funding for Geological Surveys has been cut by 50 percent over the last ten years (see figure).
- The knowledge base is a partnership between government, industry and universities.
- Government provides objective geoscience, e.g., maps and raw data, and maintains and distributes company assessment-work files.
- Universities train future geoscientists and conduct essential pure research.
- Industry contributes exploration data to the knowledge base, e.g., drilling, mapping, geochemistry, geophysics.

PRINCIPAL RESULTS

Workshop participants then divided into five breakout sessions to examine specific topics relevant to maintaining and enhancing the geoscience knowledge base. The topics and their main conclusions are presented below:

1. Government Responsibility for the Geoscience Knowledge Base

- Government has a fiduciary responsibility to provide the basic geoscience knowledge base.
- The government knowledge base is the objective foundation upon which the more subjective and focused industry work is carried out.
- The geoscience knowledge base has uses beyond the mineral industry, such as land-use planning, health and safety, hazard prediction and environmental issues.
- Government's contribution to the knowledge base is essential to maintaining Canada's competitive advantage. The knowledge base must be continuously upgraded.

2. Information Dissemination and Database Gaps and Needs

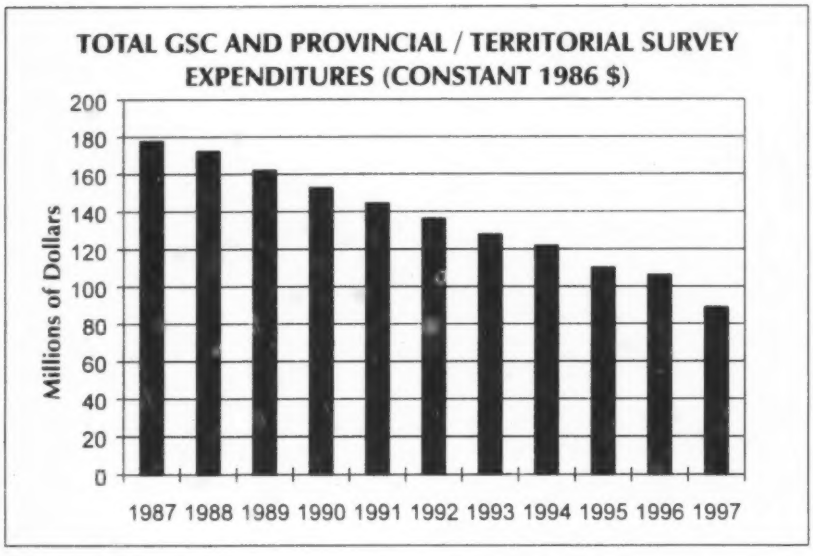
- Governments should enhance open-file format for rapid release.
- Continue developing and using digital formats. However, costs for these products should be kept in line.
- Hard copies of most information products are still required.
- Factors influencing priorities for new work include: areas not covered, client demand for information, age of data and quality of previous work.

3. University Training: Meeting the Needs

- Develop fewer centres of specialization.
- Encourage industrial-research chairs.
- Ensure curricula include adequate field training (linked to accreditation?).
- CGC five-year plan: collaborative effort of larger geoscience community.

4. Performance Measures for the Impact of Survey Programs

- Performance measures should include both industry testimonials and cost–benefit analyses.



- ✦ Today's emphasis is on short-term performance measurement – longer term measurement must also be considered.
- ✦ The geoscience knowledge base is a critical foundation for the whole mining industry.

5. Alternative Funding Mechanisms for Geological Surveys

- ✦ Retain revenue from existing streams.
- ✦ New dedicated levies on industry.
- ✦ Partnerships.
- ✦ Privatization.
- ✦ Existing Mechanisms.

These workshop-deliberation results were reported to ministers, including a summary of the perceived attractive features of countries competing with Canada for exploration dollars, e.g., elephant country, lower taxes, less regulation, welcoming attitude. Canada's advantages were summarized as follows: better geoscience knowledge base, good services infrastructure and logistical support, good mineral potential, superior health and safety, and political stability. It was concluded that it is still advantageous to explore at home, but not if the erosion in funding to government surveys continues.

RECOMMENDATIONS AND ACTIONS

The workshop also resulted in three recommendations being made to Canada's Mines Ministers:

1. That all levels of government recognize the critical importance of the geoscience knowledge base and commit to ensuring that it is maintained and enhanced.
2. That the continued erosion of government geological surveys be immediately halted, for a period of at least one year.
3. That an industry-led task force be struck to examine funding options for federal and provincial surveys, and to bring recommendations to the 55th Mines Ministers Conference in Calgary in 1998.

The Mines Ministers considered the workshop recommendations during their closed meeting and agreed to the following response:

1. Ministers acknowledge the critical importance of geoscience.
2. It is up to each jurisdiction to separately decide what its budget should be for geological surveys.
3. Ministers agree that a task force be struck to examine funding options. However, this should be an Industry–Government Task Force with government's input being facilitated through the Intergovernmental Working Group (IGWG).

All in all, the workshop was considered a useful exercise by participants, and a success in that it focused on the erosion of funding for all geological surveys in Canada, and collectively made ministers aware of the problem. The commitment by ministers to examine the funding issue through a task force to report at their next meeting keeps this important matter before them for another year. Stakeholders can hope that something positive and concrete will come from the task force's deliberations.

— Mary-Claire Ward (PDAC) and Frank Blackwood (NGSC)

DISCOVERY METHODS FOR CANADIAN METAL MINES THAT OPENED IN 1997

DISCOVERY METHODS FOR CANADIAN METAL MINES THAT OPENED IN 1997

PROVINCE: BRITISH COLUMBIA

Mine	Mount Polley	Golden Bear	Huckleberry	Eskay Creek
Discovery (New or Old)	O	N	O	O
Date of original discovery (Reassessment)	1964	1981 (1994)	1962 (1993)	1932 (1988)
NTS	93A12E	104K1	93E11E	104B09W
Location	56km northeast of Williams Lake	140km west of Dease Lake	86km southwest of Houston	83km northwest of Stewart
Years of operation		1989-1994		1995-present direct shipping ore
Methods of discovery (Reassessment)	Prospecting aeromagnetic geophysical survey, trenching, drilling	Geology, geochemistry	Geochemical surveys (stream-sediment), drilling	Prospecting, drilling
Methods of later developments	Fill-in drilling, bulk sampling, metallurgical testing	Metallurgical testing, geological modeling, soil surveys, drilling	Condemnation drilling, definition drilling	In-fill drilling
Discovered (Reassessed) reserves	82.3 million tonnes grading 0.417 g/t (0.012 opt) Au and 0.3% Cu	1,519,000 tonnes grading 5.1 g/t Au in 3 near-surface deposits	90.4 million tonnes grading 0.51% Cu, 0.014% Mo, 0.06 g/t Au, 2.81 g/t Ag	1.4 million tonnes grading 59.3 g/t Au, 2719 g/t Ag (Jan 1/97)
1997 Production	Official opening - Sept. 13/97	36,600 oz Au. Official opening - Sept. 17/97	Official opening - Oct. 1/97 est. 27,000 tonnes of copper concentrate	
Employment	170	70	167	20
Mine Life	12 years	6 years	16 years	10 years
Mining Type	Open pit	Open pit - heap leach	Open pit	Underground
Milling Rate	18,000 tpd	5000 tpd → 400,000 tonnes on pad	18,000 tpd	150 tpd
Commodities	Au, Cu	Au	Cu,Mo,Au,Ag	Au,Ag
Deposit Classification	Porphyry	Vein-epithermal (Carlin)	Porphyry	Seafloor hydrothermal massive sulphide
Key Reference	MI-93A008 CIM SV 46, pp.609-622 (1995)	MI-104K008	MI-93E036/037/038 CIM SV 46, pp.313-321 (1995)	MI-104B008
Capital Cost	$115M	$10.5M	$141.5M	$17M

SURVEY OF HARDROCK DRILLCORE PROGRAMS 1996-1997

SURVEY OF HARD ROCK DRILL CORE PROGRAM IN CANADA

Fiscal Year 1996-1997

PROVINCE	B.C.**	ALBERTA	SASK.	MAN.	ONT.	QUEBEC	N.B.	N.S.	NFLD. & LAB.	P.E.I.	YUKON	N.W.T.
No. of Facilities	0	1	1	4	6	4	3	3	6	1	1	1
Staff Person Days Worked '96-'97	0	85	132	90	0	5.05	750	775	640	0	120	0
Capital Cost '96-'97 ($ x 000)	NIL	6.7	NIL	NIL	NIL	NIL	NIL	3.0	NIL	0.5	10.0	0
Operating Cost '96-'97 ($ x 000)	0.0	20.5	19.6	3.0	69.0	68.0	95.0	25.0	35.0	0	15	11.4
Core Collected and/or Delivery 1996-97	0	1546.5	2796	2664	14 625.5	0	39 000	5400.2	9 572	0	NIL	0
Core Reduction*	NIL	NIL	NIL	NIL	NIL	1 000 m	NIL	NIL	NIL	NIL	NIL	NIL
Use of Facilities Person Days (pd) 96-97 Visits (v)	0	22	80	8 v	558	45	250-300 pd	278	346 md	1	75 v	15 v
Total Core in Storage (from all years in metres)	0	33 266	87 007	219 164	1 087 677	140 624	552 000	639 676.9	923 539	0	124 400	32638.4
Total Exploration Drilling '96-'97 (in metres)	107 561	confidential	248 466	151 339	489 277	255 704	60 000	22 400	130 000	0	82 606	62 288

* *over last year*

** *There are no facilities for hard rock core in B.C.*

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